

*J. Nelson Spaulding*

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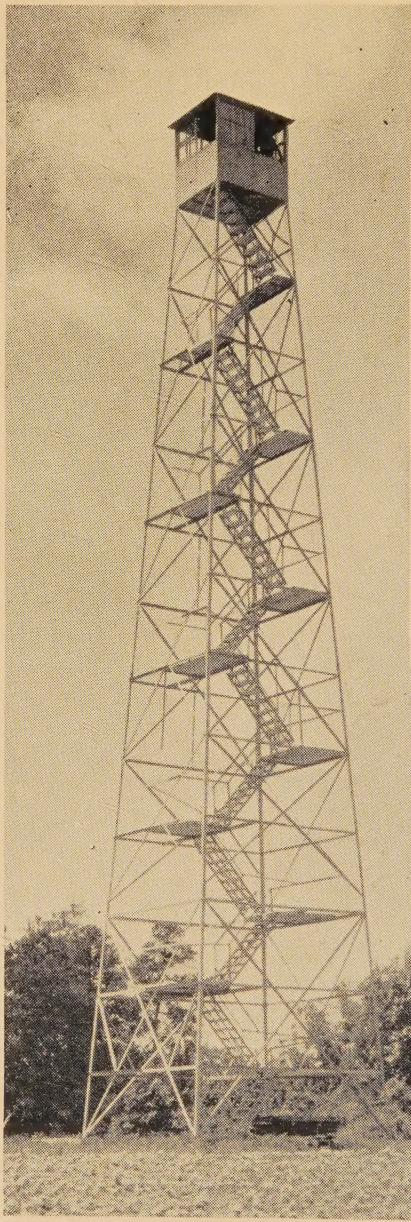
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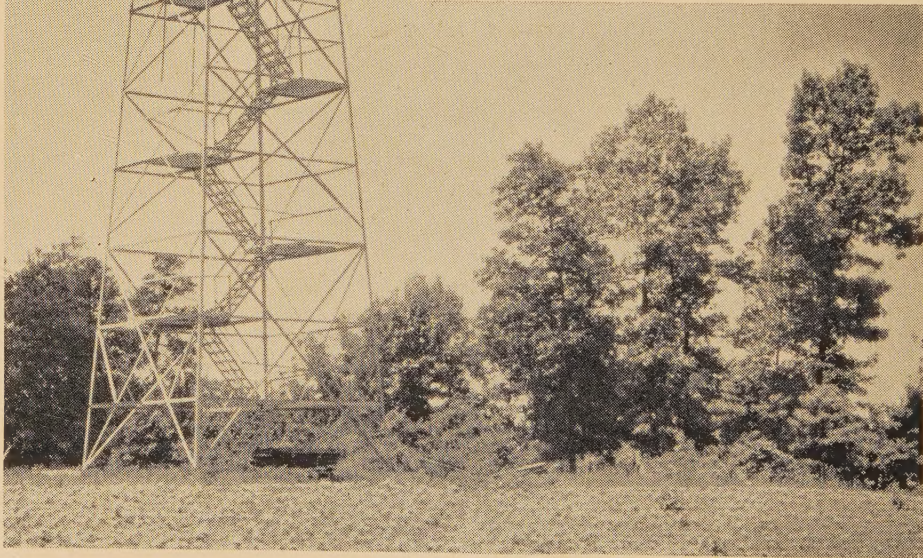
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OFFICIAL ORGAN OF THE SOCIETY OF AMERICAN FORESTERS

A professional journal devoted to all branches of forestry

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# JOURNAL OF FORESTRY

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## EDITORIAL

### A TIMBER CONSERVATION BOARD AND AN OPPORTUNITY

THE National Timber Conservation Board which President Hoover has promised to appoint deserves more than the casual interest which it has received in the forestry profession. Particular interest attaches to the proposed board because its creation was suggested to the President by the lumber industry rather than by the forestry profession. This sponsorship lends it the practical flavor that makes a strong appeal in the present administration. Its sponsors frankly give as one of the board's objectives the correction of the "prevailing condition of overproduction of forest products and consequent waste of timber, depletion of forest resources, and insecurity of employment in the forest industries." The industry thus knocks at the government's door and frankly beseeches its help. That it needs help is all too evident. No doubt its main hope is for official sanction for some means, yet to be discovered, for controlling production. The industry actually has the power right now for such control but its inadequate organization makes it impotent to exercise it. In this respect its position differs very little from that of the farm industry.

The many small operators whose wide distribution makes them difficult of organization and the larger ones who abhor the idea of coöperation with one another also have their counterpart in farming. No less similar is the fact that even in periods of depression we have successful lumbermen and successful farmers. The former have as little reason to be interested in the timber conservation board as it reflects the business troubles of others as the latter have need for federal assistance. It is patent, however, that the distress of the lumber industry has a profound bearing upon its ability to practice conservative lumbering or a more advanced form of forestry, and if for no other reason than this, foresters should take a strong interest in the proposed board.

The idea of such a board or one similar to it was proposed or discussed at the 1928 and 1929 annual meetings of the Society of American Foresters, and just prior to the former it had also been proposed to the directors of the lumber industry's national association by its secretary. The duties of the board as they were described to the President are very clearly circumscribed. It is to



be a fact-finding body that will attempt to analyze certain outstanding problems and arrive at recommendations for remedial measures. Forestry, as such, is not given as an objective and the sponsors do not intend that the board shall formulate a national forest policy. Just how this board or any other could obtain some of the basic facts needed without a long-time investigation is not quite clear, nevertheless, in the eighteen months, which is given as the time required, it should be able to report very forcibly to the President on a sufficient number of its objectives for an early start toward revolutionary realignment of ownerships, legalized control of production, more adequate fire protection, and a more equitable system of forest taxation,—all leading in the end to sounder methods of forest land management. If only a few of the objectives are reached with really workable recommendations, the way will be cleared of many barriers that now obstruct the progress of industrial forestry.

A few foresters view the proposal with suspicion and think the board will not amount to much. Others feel that there is very little that such a board can accomplish. Probably their attitude is founded on distrust of the lumber industry and the fear that no forester will be placed upon the board, or that the board will content itself with finding a remedy solely for the present financial straits of the lumber industry. The lumber industry of the past would no doubt have gone to some pains to keep foresters off the board but it is inconceivable that the lumber industry of the present would not recommend the appointment to the board of at least the

chief forester and the president of the Society. If the board should devote its efforts solely to the immediate business aspects of lumbering without regard also to the probably more fundamental forest land problems, its work would be a breach of faith and its name a mere cloak. Here again it is inconceivable that the leading figures of the lumber industry will not see an opportunity for a piece of constructive work of more than immediate benefits. Much depends upon the personnel of the board and the attention given its work. It is to be hoped that the President will appoint such lumbermen as have the ability, interest and standing of those who waited upon him with the proposal and suggested the creation of the board, as well as such foresters and others who have a thorough understanding of the problems involved. The board, if it is actually created, offers the lumber industry an excellent opportunity to show its good faith toward the public from whom it seeks help. Legitimate business interests must be safeguarded, but public interests cannot be ignored.

The board presents no less an opportunity to foresters. The day for nagging and threatening is past, as is also the day when foresters felt they must align themselves in a separate camp. Prejudice and distrust do not predicate progress. They have done more to hold up progress in industrial forestry than all our research in silviculture has done to advance it. Let those few who still entertain old prejudices toward the lumber industry lay them aside. Let foresters wish it success in its effort to extricate itself from its financial morass, and believe this to be a sincere effort



to put its house in order. From the lumber industry, on the other hand, it is high time to expect an end to the scoffing attitude toward the forester or his art; the unfriendly position toward technical men in general; and the unwillingness to accept the premise that

the public may have some interest in the manner of forest land management.

Only the friendliest spirit of coöperation should exist between foresters and lumbermen—anything else helps neither of them nor the public.



# THE FORESTRY PROBLEM IN THE UNITED STATES

By E. A. STERLING, *Vice-Pres.*

*James D. Lacy & Co., New York*

The forestry problem is not so much a problem of the forests as of the owners and the public toward them. The present unsatisfactory condition of the forests results largely from lack of economic incentive to practice forestry. The author believes that education is the national remedy but that the problem is too complicated to be reduced to any one economic or silvicultural formula. He thinks the remedial measures should represent correlated action by public and private agencies, with the public burden centered on lands of low productivity and long deferred returns.

THE FORESTRY situation in the United States today is a paradox of conflicting influences and inconsistencies. It is more economic than silvicultural, with forestry accepted as an interesting subject without taking a vital place in national life.

From early Colonial times, the forests have served without being saved, so that most of the forest lands are still in a wild, unmanaged condition. The general attitude toward the forests has been one of regret that they were being cut so rapidly. No way has been found, however, to break through the economic barrier and make it pay to grow timber as a business save here and there on a scale too small as yet to influence the net result.

The public is interested in trees, but not in timber. It wants woods, with good roads, trout streams, and other recreational features, but only vaguely realizes that there is a problem affecting the individual welfare and pocketbook. There is a general opinion that the timber is about gone; yet the people take little personal interest in the forests as a source of the wood they will always need. It is perhaps because they do not know what to do about it and consider it outside of their province.

On the other side, a fairly large group of enlightened citizens are very keenly alive to the existence of a forest problem, but their interest and activity are not reflected save in small measure in the great mass of the population. They are the ones who will do whatever is done.

It has long been recognized that the privately owned forests are the key to the forestry situation because they are by far the greatest in area and comprise the best timber and forest lands. The owners, under the general classification of "lumbermen", have been called vandals, when actually they were doing the best they could to supply the demand for a material which everyone needs and uses.

It is now more clearly appreciated that the lumbermen did not follow a course of destructive exploitation from choice, but rather under the economic pressure of competition, high taxes, and sale values which left no other alternative. They also did not choose an easy way to invest their capital, for they have pioneered on the outposts of civilization and written an epic of accomplishment across the continent.

The past decade has brought many changes, and large, progressive manu-



facturers are applying more conservative methods to the extent that it is sound business policy. The great majority of the smaller operators, even though they would like to perpetuate their business, have been unable to find a practical way of doing so.

The limited and diminishing timber supply has not brought stability or prosperity to the operating owners, but instead improved transportation facilities have opened up for nation-wide distribution the last remaining stands of original growth and greatly disturbed the balance of regional production and competition. A short crop of corn or cotton promptly raises the price, but the evidence of coming timber shortage has not been directly reflected in values nor given much added incentive to the growing of more timber. This reveals another paradox of a great basic industry suffering from overproduction and unstabilized markets instead of curtailing output and earning a margin of profit which might encourage better forest practice.

The situation in the woods is the direct result of the conflicting outside influences which have kept forestry out of the woods. The foresters have had to become propagandists and develop a distinctly American profession of forestry as contrasted with the silvicultural and engineering technique of the German textbooks.

The national situation as to present and future supply cannot be answered conclusively by statistics because dependable data are lacking. That something should be done is evident from the accepted fact that the timber is being used faster than it is being grown, and that the steps taken to provide a future

supply are as yet entirely inadequate. This point does not need to be argued nor stated in exact figures. The vital task is to fill the gap between the exhaustion of original growth and the time when regrowth will strike a balance with consumption.

The several forest regions now reflect the historical development of the locality. The national situation is a composite of the regional and local conditions, each calling for separate treatment which would be most effective if carried out under a coördinated national policy.

In New England, the timber resources which have been drawn on since the early days of settlement are contributing less and less to the industrial life of the community. It is the end of the transition stage. There is still a large aggregate supply of wood in some form, but the eastern markets are supplied largely by cheap lumber from the Pacific Coast and the large plup and paper companies are turning to eastern Canada for their pulpwood supplies. Values remain fairly constant despite the exhaustion of local supplies, with production coming more and more from small units, except in the case of a few large landowners.

Forestry has been much talked about and to an extent practiced in New England. The quite extensive forest planting is said by no less an authority than Fisher of Harvard to be largely a failure because of the diseased and generally unsatisfactory condition of planted pure stands as they approach maturity, and the declining market for second-growth white pine. Fire protection has been applied with a good measure of success to the large areas of wild land,



but no protection has been found against the spruce budworm or the hemlock looper which is now menacing the pulpwood timber of eastern Quebec and threatens to extend southward.

Save for the crude forestry represented mainly by protective measures which serve to encourage the return of second-growth when and as it will, there is no forestry in New England in any way adequate to meet the present or future requirements of the region.

The situation in the Middle States is a counterpart, with minor modifications, of the New England conditions. The same cycle has reduced the original forest to wooded areas which will not be highly productive for many years. One of the many problems is the removal and utilization of the inferior hardwoods which occupy the ground space to the exclusion of better species. In parts of Pennsylvania where practically clear cutting was practiced, a fine second-growth stand of hardwood is coming rapidly into merchantable size; but over large areas throughout the region a silvicultural miracle will have to be performed to establish commercial forestry.

The Lake States are also near the end of the exploitation period, with an area of waste land estimated at 20 million acres in need of planting. For the far distant future and as a public project the regeneration of these lands may be justified, but private capital could not afford to reforest them under existing ownership and taxes.

The Pacific Coast, with the last great stand of original growth and the finest timber on this or any other continent, is the hope and at the same time the despair of the forest industries today. The lumbermen have learned many lessons

in their migration across the continent and they are reconciling as far as possible the requirements of their business with the future production and supply of timber. Working counter to the desires for stabilization are the factors of overproduction, time, interest, and tax accumulations, and the certain fact that timber of size and quality even remotely equal to the original growth can never be expected even under the most advanced application of forestry methods.

The South will also see an end of most of its virgin supplies within a decade, but the entire southern pine belt gives greater promise of sustained yield and attractive returns from forest production than any other region. With valuable, fast-growing species which reproduce naturally even under adverse conditions, and with the gospel of fire protection being rapidly spread throughout the South, the future of this region as a source of perpetual timber supply is very promising.

Much of the land is more suitable for timber than agriculture and the aggregate area which it is believed might be profitably maintained under forest cover is well in excess of 100 million acres. This should produce at least 20 billion feet per year if even 60 per cent of it were brought into a state of maximum production. The South is richer in natural regrowth than it knows and the cut-over pine lands, especially in the South Atlantic States, are becoming stocked with second-growth from seedlings up to merchantable size. Here is where large scale commercial forestry will be practiced first, and here also the lumber and naval stores industries and foresters will jointly capitalize the opportunities.



From even a brief analysis of the general situation, it is very evident that the forestry problem is too complicated to be reduced to one economic or silvicultural formula. Many measures must be broadly applied and the final solution or the nearest approach to a solution will be a combination of developments in the whole field of forest activities, both public and private.

Education is the one nation-wide remedy of universal application.

The progress already made is distinctly traceable to various educational influences, and since knowledge is alike essential in determining what should be done and how to do it, it follows that education is the best means of presenting the problem in its many broad aspects and applying the remedies which are needed and feasible according to conditions.

There have been more radical solutions offered. One, as paraphrased by Kellogg, was "Forests by Fiat", which he effectively proved a fallacy. Public ownership, restrictive legislation, federal control, and many other suggestions have been offered but under our system of government such policies are contrary to our best traditions and ideals. Autocratic measures, backed by unlimited funds, might bring a more prompt and complete solution if the foresters could agree on a program. This is not the real remedy, however, because it will not be done.

Education is applicable in actual practice because it can be made to cover the entire field through many agencies. The public can be made to realize more fully the direct relation of the forests to individual and national welfare. Consumers of wood in its many forms

need greater knowledge of its value and proper use and should also understand that the economic basis for forest perpetuation is wise utilization, not preservation. This phase of public relations calls for educational publicity.

The private owners of forest lands need educational evidence of stability and reasonable profit, and in turn must educate themselves as they are gradually doing to the idea of sustained yield and permanent forest investment. Foresters must add further to their education by industrial research and by learning how to make broader practical application of their professional knowledge.

There is nothing new in the advocacy of education as a means of correcting the present forestry situation. Federal and state organizations and forest schools have been disseminating educational knowledge for many years, trade associations have presented their side of the problem, while public welfare associations have very effectively carried on a campaign of popular education.

The agencies through which continued educational effort will bring the most effective results are numerous. There would be much benefit if their work could in some way be correlated, and the calling of an annual forestry congress or forest products exposition under the auspices of some strong organization would go far towards a better understanding and closer coöperation. In addition to the associations and individuals directly interested, strong support is also given by other organizations such as chambers of commerce, women's clubs, game and outdoor magazines and associations, and public-spirited men



and women in all walks of life. These sincere, whole-hearted efforts are bound to bear results and they would no doubt be more fruitful under strong, centralized leadership.

Whether an effective solution can be found and applied in time to meet the nation's needs falls into the realm of prophecy. The fact is that no one knows just what the nation's needs are or will be. It is not likely that there will be an actual timber famine and the rapid changes in modern industrial life may bring about a balance between wood production and consumption.

Education is a vital factor in bringing about beneficial changes, while other developments will in turn aid the results from educational effort. There is probably more natural regrowth than realized, and better use is being made of this small timber. Improved chemical processes for reducing wood to pulp, paper, and kindred products, and even to the basic cellulose, may change the whole field of utilization, thus helping to make the available supply go farther.

Another means of filling in the gap in supplying the nation's needs may be found in imports from the enormous forest areas of Central and South America. There is marked activity in the exploitation of this timber, even to the extent that large southern lumber manufacturers are planning to bring pine logs across the gulf from Central America to be sawed and distributed through their long-established facilities. The hardwood supply in these countries, from present knowledge, seems almost unlimited.

The small sawmill is a menace to forestry and in every region its numbers increase as the large mills are cut out.

This emphasizes the desirability of ultimate combinations of private holdings and operations. Large areas give better opportunity for successive cuttings and sustained yield, a big organization can effect many economies and reduce overhead and, with a heavy investment under one management, there is a greater incentive for close utilization and permanent operation.

Consolidations of capital and properties will extend to the forest industries just as soon as they are put on a safe and profitable basis. The pulp and paper manufacturers have made good progress in large-unit development backed by extensive timber reserves, but there is yet to be created a completely balanced timber enterprise using all of the wood material and in the most profitable form from fibre or cellulose to high grade lumber. The private phases of the forestry problem would be largely solved by such organizations, equal in size and efficiency to those in other industries.

The public forests in the ultimate working out of the problem are certain to assume growing importance, with the states doing their share in land acquisition in line with the advanced forest policy of the federal government. These public forests, however, will comprise the poorer lands with low productivity until far in the future, and the test will come before they can contribute materially to the timber supply. The national forests are under efficient administration and are no longer a problem but a great national asset.

Since forestry calls for a long-time investment and also involves the public welfare, it seems to be a field where government aid as in irrigation and ag-



riculture is justified, if anywhere. This gives force to the suggestion made from time to time that the government should provide funds at low interest rates for reforestation. To whom the money would be loaned, how the forests would be controlled, and the many other details have not been worked out, but the general plan deserves serious consideration. If found sound, it might eventually, by educational publicity, be

adopted as a national policy under a special commission or administered as part of the new Farm Board.

In the final analysis, it will be the vision, knowledge, and desire on the part of those most directly concerned which will correct the present forestry situation by a combination of remedial measures. These must be fostered by education and supported by enlightened public opinion.



# FOREST RELIEF<sup>1</sup>

By R. C. HALL

*Forest Taxation Inquiry, New Haven, Conn.*

Forest lands not adapted to profitable private management must be taken out of private hands. For the private lands remaining, the public must provide favorable conditions to make the business of forestry attractive. The slogan of the day is farm relief; why not also forest relief? The author, a forest-land tax expert, enlarges upon the taxation problem.

## THE SITUATION

**F**ORESTRY is the art of managing forests for the benefit of mankind.

Some of the most important benefits of forestry yield no direct financial returns. These are watershed protection, conservation of wild life, preservation of climatic and scenic values, recreation, and the like. Other indirect but substantial benefits accrue to the public from an adequate and continuing supply of forest products.

Plans for providing a future supply of forest products cannot be based on definite figures. There is little gained by comparing present consumption with estimates of present timber reserves and of current growth. Consumption is subject to rapid change in quantity and form, and estimates of supply and growth are at present unreliable. It seems that the substitution of other materials for wood will continue. It seems equally probable that uses for wood of small trees will greatly increase. In our more thickly settled regions, near local centers of population elsewhere, and in districts where other industries, such as mining, use timber in quantity for their

operations, it is not likely that profitable markets for forest products will fail. The high cost of transporting wood long distances and of manufacturing satisfactory substitutes, gives every advantage to the relatively cheap, locally grown, wood materials. Elsewhere it is not so easy to forecast future markets, for while demand for wood with increasing population will probably overcome in time the increased use of substitutes, market prospects in the more immediate future for the less accessible and less useful supplies of timber are beclouded with uncertainty. But regardless of financial returns, the indirect benefits of forest cover previously mentioned are such that the nation cannot tolerate great areas of unprotected forest land.

The present status of forestry may best be considered from the standpoint of land ownership. Out of a total forest land area of about 469 million acres, 100 million acres are in public ownership, 127 million acres in farm woodlots, and 242 million acres in other private hands.<sup>2</sup>

Of the publicly owned forest land,

<sup>1</sup> The views on taxation expressed in this article are the present opinions of the author, and in no way represent conclusions of the Forest Taxation Inquiry. September, 1929.

<sup>2</sup> Forest Statistics of the United States. Statistical Bull. 21, Part 1, U. S. Dept. of Agr., p. 4. These figures are rounded off from the estimates of 1925 in Table 3.

about 90 per cent is in national forests. Most of it is being managed so as to conserve the benefits of a productive forest cover. There are many details of practice and policy still to be worked out, but in general satisfactory progress may be expected.

Most of the farm woodlots are poorly managed, but they are favorably situated with respect to fire protection and not likely to become permanently unproductive on any large scale. With all the extension of information on woodlot management, an increasing application of forestry by farmers may be expected. The big problem is not here.

Of the 242 million acres of private forest land outside of farm woodlots, only about 10 million acres,<sup>3</sup> or 4 per cent, are believed to be under some form of permanent management for timber crops. The reserves of virgin timber, under pressure of heavy carrying charges, are being cut without regard to present demand for lumber, depressing prices and thus indirectly discouraging private forestry. Most of the cutting is done with entire disregard for establishing conditions favorable to growing future timber crops. In the older regions, vast areas have burned over again and again until their productive capacity has been greatly reduced. The local governments in these regions, embarrassed by loss of timber and sawmills from the tax base, have piled taxes on cut-over lands until millions of acres are on the delinquent list, abandoned by their former owners and wanted by no one. Even in the more recently devel-

oped regions of the far West, the rapid increase of unproductive cut-over land is a menace both to the prosperity of local communities and to the integrity of forest fire protection systems founded on contributions from all forest landowners. Here is the problem; what shall be done about it?

#### THE REMEDY

Whatever plan is adopted to remedy the forestry situation, there must be some provision for direction and coordination of effort. This is a question of detail, not necessary to a discussion of fundamentals. It has been suggested that a federal forest board, representative of all interests concerned, be established as the central agency, supplemented by similarly constituted regional boards to deal with the peculiar problems of each forest region. Some such organization will afford means of directing and making effective a remedial program.

The first step toward improving the situation is to recognize that a substantial part of our 242 million acres of privately owned forest outside of farms is of such a character that it is not likely to be used for growing forests as long as it remains in private ownership. Cut-over districts where there are no reserves of old timber to carry the forest enterprise while new crops are growing are not favorable to private forestry, unless there are profitable markets for short-rotation products or incidental sources of intermediate revenue from the land. Forests composed chiefly of very slow-

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<sup>3</sup> The Committee on Industrial Forestry of the Society of American Foresters gave a preliminary figure of 8,550,000 acres, "under industrial forest management to stay," excluding California, from which it had no data. JOURNAL OF FORESTRY, January, 1929, p. 102.



growing species, or which on account of inaccessibility or difficult logging conditions are exceptionally expensive to operate, are likewise unattractive. There are lands where site conditions have so deteriorated from repeated burning and erosion that the cost of restoring a productive forest is prohibitive to private enterprise. Granted that the public interest requires that forest cover be kept or restored on such lands for indirect benefits, this can best be accomplished under public ownership. The only alternative would be such heavy government subsidies that the more certain method of direct ownership would probably be no more expensive in the long run.

It is not intended to imply that all additions to the public forests need be of the most unpromising situations. It will be expedient to continue the purchase on a relatively small scale of accessible and productive forests for demonstration purposes, primarily as part of the educational effort.

The federal government and many of the states have established the policy of buying forest lands. Appropriations for this purpose should be greatly increased. The federal government will have to shoulder most of the burden in the poorer states. There is enough land obviously best adapted to public ownership to occupy the attention of public purchasing agencies while additional research in land utilization is carried on to enable the classification of the more doubtful areas. It is impossible to say just how much land should be included to complete the program. It might be that there should be added from 50 to 100 million acres to the present area. Allowing 42 million acres for withdrawal from private forest land for agri-

culture in the next few centuries, and assuming that from 50 to 100 million acres are bought for public forests, there would be left from 100 to 150 million acres of forest land to remain permanently in private ownership. Surely this would allow a sufficient field for the exercise of private initiative in forestry practice. But will the owners use this land to grow crops of timber, or will they merely hang on to title as long as possible, hoping for some unexpected development to give it value?

Few go so far as to hold that owners of forest land should be compelled by law to practice forestry at their own expense and risk. Considerations both of justice and of feasibility forbid. Regulatory measures under the police power of the states are undoubtedly necessary, but can only be effective when supported by public sentiment and approved by a large majority of the forest landowners concerned. Such measures may eventually go farther than merely to deal with slash disposal and fire protection. They will be useful to hold in line the non-coöperative minority after forestry is established as a profitable business, rather than as a means of bringing about that condition.

How does the nation deal with other matters of public interest? If it seems desirable that ocean shipping be developed by American business men, the government gives construction loans at low rates of interest and fat contracts for carrying mail. Development of airplane transportation is also promoted by means of mail contracts, with general approval. In order that manufacturing industries may flourish, consumers are taxed by means of protective tariffs. If agriculture is to be encouraged, a farm

board is created with wide powers and millions of dollars of public funds to bring about conditions of greater prosperity for the farmer.

If forestry on private lands is in the public interest, the public must establish conditions that will permit forestry to become profitable to private operators. It should do this through both federal and state action. The federal government should enlarge its present coöperative effort to provide adequate protection. The states should do their share in protection, and also grant appropriate taxation.

Owing partly to the improvident manner in which our forests have been cut, the fire hazard is, in general, very great. From time to time insect infestations and diseases prove destructive. It will be a long time before the general restoration of a healthy forest cover will bring these dangers down to normal. During this period an extraordinary effort should be made to cut losses. There is need to reëxamine standards of how the cost of this effort should be met. It is likely that owners of cut-over land should not be expected to bear the one-half of fire protection expense assumed to be their portion. Perhaps the forest industries engaged in increasing the hazard should contribute to protection cost by means of a severance tax on the removal of forest products rather than entirely on an acreage basis. In any case, the expenditures should be greatly increased, most of the increase to come from public funds. Little new ground

needs to be broken in legislative policies. Further research in methods and much larger appropriations are called for.

Forestry not only needs much better protection from fire and other casualties, but also relief from burdensome and ill-adjusted taxation. In this field, the farmer and forest land owner have been at cross purposes. The farmer has looked with suspicion on the efforts of the "timber baron" to get from under his load, knowing too well the danger that it would be shifted to his own already overburdened back. Consequently his representatives in legislative bodies have seen that forest tax laws have generally been so framed that their application has been limited to an innocuous proportion of the forest land. The pressure of taxation on the farmer himself, particularly in the poorer communities, has led to gross over-assessment of cut-over lands in an effort to make things a little easier for the local resident. It has also led to increased taxes on virgin timber.

The root difficulty is that, in general, rural land is overtaxed. That farm taxation is out of proportion to that borne by other businesses is generally conceded.<sup>4</sup> Even the conservative National Industrial Conference Board admits it.<sup>5</sup> It is especially true of sparsely settled farm and forests districts. Our system of local government and taxation is obsolete. Schools and roads, for which the larger share of local taxes are levied, were originally supported wholly by local districts, and in most states that policy is too little changed regardless of

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<sup>4</sup> For a recent discussion of this subject, refer to an address of the Secretary of Agriculture at Syracuse, N. Y., reported in the Official Record, U. S. Dept. of Agr., September 5, 1929.

<sup>5</sup> Cost of Government in the United States, 1925-1926, p. 116.



the injustice which results under modern conditions.

The remedies usually proposed depend on either shifting the support of what are now local functions directly from local to state governments, or on further development of "state aid," as the distribution of state-collected taxes among the poorer localities is called. If the state raises the additional revenue for such purposes from the general property tax, there is some relief for landowners in the poorer districts. More general and substantial benefit is given to landowners if this revenue is obtained from other sources, such as inheritance, income, or business taxes. A trend in the direction of wider support of country schools has been established in many states. The use of the gasoline tax in support of road building and maintenance is increasing. Even some progress is reported in more economical organization of local government. Nevertheless, accomplishment in these directions in most states is only sufficient to alleviate the worst evils, and far more radical changes are needed. At present the farmer and forest landowner are too often engaged in trying to shift the excess tax burden from one to the other, instead of to where it properly belongs. By working together for a substantial reduction in rural-land taxation, they may both get permanent relief.

Reduction of rural-land taxation still leaves unsolved the question of the property tax on timber, which is collected each year from the time the stand becomes merchantable until it is cut, and threatens to absorb all profit in growing it. In some states, a yield tax, payable when the timber is cut, has been offered as a substitute for the property

tax on growing timber, but usually under conditions that have greatly limited its application. The yield tax is sound in principle as a substitute for the property tax, and it might possibly be extended by a graduated application to old-growth timber if the practical difficulties could be overcome. However, if the public wants private forestry applied to the dwindling reserve of virgin forest, it should provide a stimulus by giving up the property tax on timber altogether, where timber is treated as a crop.

To make the proposal consistent in the eyes of the farmer, all crops in the hands of the producer should be relieved of the property tax. This exemption should be granted only to timber that is under suitable forestry management, as certified by the state forest authority. Principles for the guidance of the state forest authorities in fixing the requirements in each region may be determined by the regional forestry boards. For administrative and other reasons, such certification should not be required for farm woodlots or second growth tracts in a single ownership under a specified area limit, this limit to vary in different states in accordance with conditions, possibly from 640 to 2,000 acres. Except for these woodlots and small second-growth tracts, no timber which is merchantable at the time the plan becomes effective should be exempted, unless it is included in a forest property, or group of forest properties, which are in process of conversion to sustained-yield management. Virgin timber held purely for pleasure, speculation, or destructive cutting would thus be granted no favors. If a yield tax has been substituted for the property tax, the exemption should apply to the yield

tax under the same conditions as to the property tax.

Obviously, this plan entails further reduction of local revenues in forested regions, and is practicable only in connection with a shift to other kinds of taxation to support local schools and roads. Eventually the loss in local taxable wealth would be offset by the increase in both farm and forest land values following the establishment of permanent forest industries. Exemption from the property tax to the extent proposed would not relieve the timber industry from contributing to the public revenues, since it would be subject to the income or business taxes that would make this exemption possible. However, such taxes are paid as income is realized, and do not force premature cutting of old timber or prevent establishment of new timber crops.

The indirect advantages to forestry of this conditional exemption of timber from the property tax would be far-reaching. It has been shown by Mason that widespread adoption by timber operators of sustained yield management would be likely to restore a proper balance between demand and supply of lumber, and stabilize lumber prices at a satisfactory level.<sup>6</sup> With the additional incentive provided by property tax ex-

emption for virgin timber in process of conversion to that basis, and with coöperation within the industry itself to solve credit and other financial problems, there is reasonable prospect that a very large area in the West would be brought under sustained-yield forestry. That can be done to best advantage in the near future, before the original timber is too close to exhaustion. On the other hand, the stabilization of lumber prices, brought about by adoption of sustained yield in the West, would stimulate reforestation of private lands in the East and South.

Obviously, state and local taxation cannot be altered so radically all at once on account of the constitutional changes and legislative enactments required, and the details to be worked out. Opposition may be expected from business interests which would be reached by the alternative taxes proposed. But if the farm and forest interests can be united in favor of these changes which are favorable to both, they should be made effective in time to make a great change in the situation with respect to private forestry. The knowledge that such a program is being strongly promoted will of itself exert in advance of its realization a powerful influence on the plans of forest owners.

<sup>6</sup> Mason, David T. Sustained Yield and American Forest Problems. *JOURNAL OF FORESTRY*, October, 1927, p. 625.



## MEETING THE ISSUES

By R. D. FORBES

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Too late or too early? The author views the timeliness of forestry dispassionately and offers three remedies: a campaign to promote the use of forest products; a statute to penalize forest products whose production involves devastation of forest lands; and a statute to restrict the yearly cut.

AS a movement to solve the present forest problem of the United States, forestry has come either fifty years too late or fifty years too early. Whether early or late depends upon the point of view.

Forest conservation is fifty years too late if one considers our forest situation from the point of view of the thoughtful citizen who regards with alarm large-scale conversion of productive land into a desert, dissolution of prosperous communities almost over night, and unheeded reduction, day by day and year by year, of a great basic natural resource, chiefly in virgin forests. The broad facts (1) are known to all such: that the estimated present growth of the American forests is six billion cubic feet of wood yearly, and our consumption and wastage by fire and rot is twenty-four billion cubic feet; that the ratio of growth of sawtimber material to consumption is even higher, or one to seven; that over eighty-one million acres of forest land have already been reduced to "an unproductive waste"; and that in spite of the efforts of the federal government, the States, and private landowners, thirty-eight million acres of forest land burned over in 1927.

While our forests dwindle before fire and saw, the thoughtful citizen and his compatriots yearly plant a paltry hun-

dred thousand acres of denuded land. Far from requiring the clearing of forest land for agriculture, between 1880 and 1920 the Nation witnessed the abandonment of fourteen million acres of improved farm land which was unable longer to pay its way in crops. With their forests and their forest industries gone, scores of communities and even counties in once heavily timbered regions, such as the Lake States and the South, are facing abandonment or bankruptcy. Forestry—the growing of new forest wealth to replace the old—has indeed come fifty years too late as a remedy to the situation so viewed.

On the other hand, to the manufacturer of lumber and to those engaged in many if not all of our other forest industries, forestry generally appears as a business proposed fifty years in advance of any possible success. Overproduction has been an ever-present threat to the forest industries of the country. Not only the absolute amount of lumber produced, but also the number of feet consumed per capita, have been dropping for the past twenty years. Occasional shortages have temporarily improved the market and have brought hectic prosperity to the sawmills, but hundreds of small portable mills have always set up anew or increased their operating periods in time to overstock the lumber

yards and reestablish the "buyers' market". Were there a market for their products, the sawmills of the United States, if run to full capacity year-long, could manufacture sixty to seventy-five per cent more lumber than their normal output (2). Other forest industries have had no better markets, as witness the hardwood distillation, the tannin extract, and the naval stores industries. Even the paper pulp industry, borne on the crest of ever-increasing demand for its product, has felt keenly the competition of Scandinavian importations. No one better than the forester knows how uncertain and discouraging over long periods are the markets for the very wood which it is their business to produce.

A thorough appreciation of these two points of view is necessary to any solution of the Nation's forest problem. The apparent paradox of a great industry unable to sell its products in the face of a rapidly *dwindling* supply of raw materials can be understood only if the element of time is taken into consideration. The fact that trees take anywhere from 20 to 100 years to reach merchantable size sets the forest problem apart from all other problems of crop production.

Three new measures are here proposed to solve the problem so stated; not new in conception, but new in execution. It is assumed that, in addition, all present measures will be continued and vigorously expanded: fire protection, research in timber growing, and the application of whatever skill and knowledge the foresters now possess. That these measures alone will not solve the problem is evident from the fact that the last ten years have brought no reduction in the area of forest yearly devas-

tated in the United States, and that most of the forest industries are so perplexed and discouraged over the current market conditions as to have no time to contemplate the future.

Five years have elapsed since the much-heralded Clarke-McNary Act was passed. Yet it will take an incorrigible optimist to believe that these years have brought about any substantial change for the better in the vital aspects of our forest situation. The 1928 report of the committee of the Society of American Foresters on the progress of forestry on private lands—which constitute nearly four-fifths of all forest lands in the United States—showed that a negligible percentage was being handled for continuous forest production. By handling for continuous production is meant the intelligent ordering of a forest operation so that the quantity of forest products yearly removed from the land does not exceed the quantity which is yearly grown. This is the practice in our National Forests, and in nearly all the forests of Europe. Any other method of handling inevitably leads to the exhaustion of the forest and the closing of the manufacturing plant dependent on it.

Of the additional measures which must be employed to meet the situation the first is a vigorous campaign to expand the domestic and if necessary the foreign markets for our forest products, particularly those obtainable from the incredible quantity of wood now left to rot in the woods or being burned on the refuse piles of the manufacturing plants.

Enlarged markets will make possible an application to the forest industries of a principle which has become a byword in another great American industry: the utilization of "everything but



the squeal" of the hog by the Chicago meat-packers. The proportion of the total cubic content of a felled tree which appears in such a product as lumber is certainly less than one-half, and may be as low as one-third. In other forest industries the proportion utilized is much greater, perhaps reaching three-quarters in pulp manufacture. In lumber operations, knotty top logs and all limbs are left to rot in the woods because they would produce only such low-grade lumber as there is no present market for. A recent study of logging in the Douglas fir region shows that one-fifth of the original stand, or the equivalent of 21,407 board feet of sound wood, is left after logging, of which half is sawlogs. The bark on pulpwood is worse than valueless. And the often clear, high-grade lumber contained in the slabs, or outside cuts of a log, must be deliberately burned to get rid of them, because it is of such short length or narrow width as to be unsalable to a fastidious American public.

Were there markets for such portions of the felled tree as are now wasted, the per unit costs of production could be greatly reduced, and a wider margin left between cost and value, to be credited to the standing timber. The example has been cited (1) of a stand of mixed hemlock and hardwoods in Pennsylvania from which lumber alone yielded gross receipts of \$288 to the acre. But the additional utilization of hemlock bark, mill waste for lath, kindling, and pulpwood, woods and mill refuse for hardwood distillation, and similar saving of waste, increased the gross receipts to \$569. A forest landowner might well see a worth-while compensation in raising forest products worth \$569, but not

for raising products worth only \$288.

Furthermore a market for the products from small trees would enable the landowner to salvage at a profit some of the very large volume of wood which Nature herself "wastes". Systematic removal, in thinnings, of trees which would otherwise be crowded out of the forest, die, and rot, in the process of bringing a forest to maturity, may double the quantity of utilized material produced over a tree generation.

The effort to expand the market for forest products involves both increased research into the qualities of our many kinds of wood, and an aggressive campaign to develop markets based on the qualities so determined. That we have not yet glimpsed the possibilities in wood is perhaps best assured by the fact that although mankind has written and read for tens of centuries, he has written on and read from a page made from wood pulp only about a hundred years. The process for manufacturing silk from wood, commonly known as the rayon process, is a development of the present century. The familiar glass milk bottle is even now giving way to the less brittle fibre container. Walde-mar Kaempfert predicts that the well-dressed man of the future will wear a suit made from wood pulp; after a couple of weeks he will throw it into the waste basket, instead of sending it to the presser or the dry cleaner. A great manufacturer of pulp and paper from wood now advertises a paper mulch to keep the weeds out of agricultural crops and conserve moisture; should the experience of the Hawaiian pineapple growers with such a mulch prove adapted to crops in the United States, an unheard-of new market opens for a product ob-

tainable from small trees. These new uses for wood, and many others that might be cited, seem fantastic today, but we may confidently expect them to be the commonplaces of tomorrow.

It is for the forest industries to carry on, or at least finance, the investigations into wood qualities, and to develop new markets for forest products. As stimulating and above all coördinating agencies the state and federal forest services have an unquestioned place, the latter also as the manager of the largest forest property in the world. That the federal department of commerce has a place in this movement becomes plain when it is remembered that its representatives in foreign lands are partly responsible for a seventy-nine per cent increase in exportation of American lumber and timbers between 1920 and 1928. Japanese imports of North American pulpwood increased by nearly fifty per cent between 1927 and 1929.

Why should not the United States lead the world in its exportation of forest products or by-products, just as it has for many years supplied two-thirds or more of the world's demand for turpentine and rosin? Our trade representatives abroad are the natural prime-movers to that end. Let those who are horrified at the thought of exporting any of our fast-dwindling supply of forest products consider that the forests are a replaceable resource, and that the surest way to persuade landowners to replace them for future domestic use is to guarantee a market, somewhere, for their products.

The great evil of the present forest situation in the United States is not our rapid consumption of forest products either at home or abroad. It is our

failure to replace the forests we are cutting. Considering both the present lack of knowledge as to how American forests may be reproduced, and the present weakness of the markets for forest products, the landowner can hardly be expected to replace the forest he cuts with another just like it. But it is high time that he be denied the right so to cut it as to reduce the land to a desert, incapable of growing another crop of vegetation useful to man unless it be laboriously and expensively hand-planted. The passage of a federal law discouraging forest devastation is the second of the three steps in the solution of the forest problem of the United States.

The measures necessary to prevent devastation of forest lands by logging are in most regions extremely simple and inexpensive. They have been the subject of investigation by the federal forest service since 1920, and are described in a series of official bulletins entitled "Timber Growing and Logging Practice" in the several forest regions. Although no one claims finality for these prescriptions, serious objections have not been raised to the fire protection, reservation from cutting of seed trees, or temporary suspension of grazing, therein described as the least measures necessary to keep forest lands productive after logging. They do not ordinarily include the abandonment of modern methods of cheap logging, and in no instance require direct investments such as planting or other artificial reforestation. Only—and this is the fact to remember—they must be applied by the logger. It is the logger who should be held responsible for keeping forest land from devastation.

In the opinion of a former chief of the United States Forest Service the fed-



eral government, under its constitutional sanction "to promote the general welfare", may prevent the devastation of forest land. Certainly such abuse of the rights of private property as will convert productive land into a desert warrants a testing of this belief. It is regrettable that a federal statute should appear necessary, rather than state laws. Time is, however, an element in the situation, since each year of delay adds at least one and a half million acres to those already devastated in the United States. It would take a long time to persuade the legislatures of the twenty main timber-producing states to pass a law of this kind. Again, most of the state forest services are hampered right and left by politics. The forest services of only half a dozen states are so organized that they are not subject to political interference in greater or less degree. As small organizations, unattractive to political use, they may be relatively independent; but if expanded to a point where they have substantial patronage to distribute they will be subject to the same influences as other departments and bureaus of their state governments. Hence the need of a federal law. Its nature will be described later in connection with the final measure of the three proposed.

Stimulation of the market for forest products and stoppage of devastation will not fully meet the situation. Better prices for forest products will stimulate production, again depressing the market and causing waste on an even larger scale than before. There must be some restriction on the quantity of lumber and other forest crops which may be harvested each year if we are to achieve the continuous forest production earlier defined.

This restriction will eventually balance the yearly cut against the yearly growth, but temporarily should be modified by the condition of the forest capital. That is, in regions where large areas of virgin forest represent an accumulation of capital, the harvest can and should be larger than the growth. In other regions containing almost all unmerchantable timber or recently cut-over land the forest capital of most tracts must be built up before it is possible to harvest yearly and without interruption what the land can in time be made to produce. To determine the allowable cut expert study of conditions in all of the exporting timber regions will be necessary. The rate of growth, for various combinations of soil and climate, of most of the important species is already known, but the area in each condition is only very roughly known for most regions.

Furthermore, justice to going businesses demands that the situation of each owner be studied. Any attempt to require the immediate upbuilding of a timber reserve by a lumber operator, for example, who owned 50,000 acres of wrecked cut-over land and only 10,000 acres of virgin timber, might reduce his allowed cut to a point where it would pay him to abandon the cut-over land to the state in satisfaction of taxes. And even a strict limitation of the cut to what the 10,000 acres alone are capable of producing continuously might so reduce the yearly output of the mill as to make its operation impossible. In both cases the cure would be as bad as the disease. But a policy which credited the 50,000 acres of cut-over land, *as soon as it was put in condition to reforest*, with a yearly growth expressed in terms of

board feet, thus increasing the allowable cut of the property as a whole, would have the opposite and highly desirable effect of encouraging the reforestation of land which had previously remained idle. In short, over-cutting could hardly be stopped under all circumstances.

Here again, because political administration of so far-reaching a statute would be intolerable, action should be federal. The most feasible method of putting into effect the necessary restriction on cut would be for the United States to require all railroads and other public carriers to accept for interstate shipment no forest products unless accompanied by a certificate stating that they are not derived from land devastated or over-cut in their production. The states should be encouraged to calculate the allowed cut within their borders and issue, through their departments of forestry, the necessary certificates. But all such issuance should be subject to federal approval, and those states which preferred to leave the whole matter in federal hands could do so.

The effect of restricting yearly cut to yearly growth would be to reduce temporarily the cut of eastern forest products and to increase the cut of western. Reduction of the eastern cut would result largely from preventing small portable sawmills from coming into existence to take the place of the present large operations which for the most part will "cut out" and cease manufacture during the next 10 years. Reduction in the cut of the Nation as a whole will not be sharp (3). There is no possibility that the people of any state will be forced to go outside its boundaries for forest products which in the absence of the proposed statute would be available

within them, because intrastate shipments are in no wise restricted.

Whether a federal statute requiring a clean bill of health for forest products borne in interstate traffic may be challenged on constitutional grounds is beside the point. The courts alone can determine this. The fact that the prairie states will suffer more severely from the mismanagement of the forests in the timber-producing states than those states themselves raises the matter to the status of a national problem. So far this point of view has not been challenged in the administration of that section of the Clarke-McNary Act which asserts the right of the federal government to purchase forest land solely for the production of timber. Should the federal statute be declared unconstitutional it will be necessary to attempt the necessary amendment of the federal constitution, or to seek the same ends through state action. The American people, faced with a necessity recognized by nearly every other progressive nation, will not be turned aside from a real solution of its forest problem merely because the way is long, or the path steep.

#### REFERENCES

1. Greeley, W. B., *et al.* Timber: Mine or Crop? U. S. Dept. Agri. Yearbook, 1922.
2. Kirkland, B. P. Continuous Forest Production of Privately Owned Timberlands as a Solution of the Economic Difficulties of the Lumber Industry. Jour. For. 15, No. 1, 1917.
3. Mason, D. T. Sustained Yield and American Forest Problems. Jour. For. 25, No. 6, 1927.



# A FOREST POLICY FOR THE NATION

By P. A. HERBERT

## *Forest Taxation Inquiry*

The author offers a solution of the forest land problem predicated on the opinion that the American people are not now ready for public regulation of private forests. He believes his remedies will induce many private owners to practice forestry and to sponsor other measures to force recalcitrants to do likewise. He offers, extension of National Forests; limitation of public timber sales to cases of urgency; expansion of federal marketing facilities; creation of forest land banks for issuing loans on sustained yield operations; creation of national and state forestry boards; increase of state protective effort and enlargement of extension activities to assure interpretation, dissemination, and adoption of forestry knowledge.

THE extreme brevity of this essay permits only a general exposition of the actual forest problem and makes it necessary to confine the explanation of relief measures to their more salient characteristics.

The original forest area in the United States of 820,000,000 acres has been reduced to 470,000,000 acres, most of the reduction being absorbed by other land uses, primarily agriculture. However, studies of agricultural crop production and demand have led to the conclusion that there need be no further reduction in forest area to meet agricultural requirements, at least not for the next 50 years. Another study concludes that this remaining forest area, if kept at its maximum productivity, will produce sufficient wood to meet the nation's ordinary future needs.

Unfortunately, these 470,000 acres are not now in a condition of maximum productivity. About 100,000,000 acres are covered with virgin timber, another 150,000,000 acres are in farm woodlots, and the remaining is cut-over land of which about 100,000,000 acres are *not* restocking. It is estimated that 1,000,000 acres of the 5,000,000 acres of virgin

timber cut over annually will also not restock. The total cut is about 27,800,000,000 cubic feet annually, 30 per cent of which, according to estimates, already comes from second growth. This cut, plus the destruction by fire and other agencies, is much more than the annual growth; it is estimated that the cut of sawtimber is over five times its annual growth.

Fifty-five million acres of the virgin timber are in public ownership in addition to 45,000,000 acres of cut-over land. The remainder, representing 79 per cent of the total, is in private ownership, of which 220,000,000 acres are said to be held in commercial tracts. Most of the publicly owned timber area is managed according to forestry principles, whereas only 10,000,000 acres of the commercial tracts are reported under some plan of forest management. The farm woodlots in the aggregate are in mediocre condition and under indifferent management.

This forest condition has resulted from the first stage of industrialization, industrial exploitation. This period consists of the destructive appropriation of natural resources for the satisfaction of

immediate human desires regardless of its effect on the latent natural agents, in this instance the productive capacity of forest land. Such a period of exploitation seems necessary to encourage pioneer effort. However, in the absence of governmental restraint this period is continued long after justification for it disappears, because of the very general craving for hasty accumulation of private fortunes, and because of indifference for future national prosperity. Thus a tremendous resistance is built up against the introduction of the second stage of industrialization, that of industrial development.

This resistance is the inevitable result of the economic and social structure of the nation. We have allowed the capitalization of property rights in forest land on the basis of non-governmental interference, and it is only natural to resist any action which would reduce the profits which society permits the owner to appropriate.

Compulsory measures to safeguard society's interest do not always interfere with private profits, but in the present chaotic condition of the lumber industry they probably would do so. Most of the problems facing the industry such as overcapitalization, excessive competition, overproduction, overcapacity, inroads of substitutes, and inadequate merchandizing have resulted from the failure of the entrepreneur (not society) to visualize the future. Liquidation, the industry's prime motive, is the antithesis of industrial stabilization which requires more capital. This stage of industrialization is hampered also by speculative cut-over land value, the myriad of small owners, the large and varied physical,

technological, and social risks to which the invested capital is subject.

Such, briefly, is the situation. The individual demands that his investments be safeguarded, posterity that they be sacrificed when necessary to pass on the forest source unimpaired, and society, which acts for both, must effect a compromise. So the remedial measures here set forth are predicated on the opinion that the American people will not *now* brook an extensive invasion of private property rights, and that measures to publicly regulate private forest management will be overwhelmed by the people, led by determined opposition of *all* business men who see in such measures powerful precedent for further encroachment of public control. If the measures here proposed are put into effect, a large part of the nation's forest land will be receiving scientific care within the next ten years, and the owners thereof will then be instigators of measures to force others to do likewise.

#### FEDERAL RESEARCH

The research program of the Forest Service is ample for the next ten years. All federal projects bearing on forestry such as many studies in agricultural (rural) research, lumber utilization, and foreign and domestic markets should be coördinated with Forest Service activities. If pressing questions require research in the basic sciences, it should be undertaken rather than await the doubtful establishment of endowed forest research institutes.

#### NATIONAL FORESTS

The greatest social return will be secured from the national forests under their present administration; they are an integral part of a sound national for-



est policy. The evidence of past disregard for the national welfare by the states and private individuals effectively refutes all arguments to take these forests out of federal control.

#### OTHER PUBLIC FOREST LAND

Congress should enact legislation so that all public land *now* primarily valuable for forestry, such as parts of the Public Domain and revested grant lands, be administered in accordance with forestry principles by the Department of Agriculture. Revested lands contributing moneys to the county in lieu of taxes should not also contribute part of their income.

#### INDIAN FOREST LAND

Congress should promulgate a policy that tribal Indian lands of primary value for forests are not subject to allotment and are to be managed by the Indian Service so as to secure the highest economic and social return for the whole tribe *for all time*. Any hardship resulting to the tribe from the temporary diminution of receipts should be alleviated by Congressional appropriation.

#### TIMBER SALES POLICY

Where doubt exists the error should be to cut too little rather than too much public timber. No timber should be cut unless it can be *clearly* shown that such a felling will prevent a definite social loss. Custodians of public forest land must also adopt a more aggressive and intensive policy of forest protection and strengthen public relation activities.

#### FEDERAL ACQUISITION

The federal government should acquire additional forest land just as fast as is politically expedient and adminis-

tratively practicable. New acquisition units should be located where they will be of greatest social value, and where they will create the least opposition. A definite, but tentative not too ambitious goal should be established, to wit: 15,000,000 acres in the East, 6,000,000 in the Mississippi drainage, 8,000,000 in the northern part of the Lake States, and 20,000,000 in the West. Most of this land in the East and Middle West will be secured by purchase. That in the West will be largely secured by exchange. There it is more a matter of consolidating and rounding out existing bodies of government-owned forest land.

#### ACQUISITION BY EXCHANGE

The present exchange laws are not equitable when government stumpage figures in the exchange, as the local community usually loses all the revenue it would have received had this stumpage been sold in the usual way. Lack of space does not permit a detailed discussion of the problem. Relief can be secured by Congressional authority to pay the counties the equivalent of 25 per cent of the value of national forest stumpage absorbed in exchanges.

#### STABILIZING REVENUE OF COUNTIES CONTAINING NATIONAL FORESTS

Congress should authorize *counties* having national forests within their boundaries to borrow funds annually for operating and capital expenditures for roads and schools, not to exceed 50 per cent of the expected sustained annual income to the county from public forests. The loan would bear a rate of interest equal to the current rate that the federal government is paying at that time on borrowed funds. Interest is to

be paid annually; defaulted interest may be added to the face of the loan and further loans refused. The county's share of any receipts from the national forest will first be used to redeem any loans outstanding, the remainder being paid to the county as heretofore. Probably with more experience the loan limit could safely be raised to 75 per cent of expected receipts. This measure will: (1) reduce local opposition to national forests; (2) encourage the county to assume a larger share of road and school burdens; (3) aid county finances before sustained yield arrives; and (4) stabilize the county's finances for all time, doing away with extravagances when an unexpectedly large apportionment is received.

#### BROADEN SCOPE OF CLARKE-McNARY LAW

Section 4 of the Clarke-McNary Law should be broadened to insure planting stock for *all classes* of forest land owners. In non-coöperating states the Forest Service nurseries should be authorized to furnish planting stock at cost.

Section 2 of this law should also be broadened to include other agents of destruction such as diseases, etc. Action should be taken to increase *immediately* the federal share of protection costs to 25 per cent of the estimated total cost, provided that the federal share does not exceed the sum of state and private expenditures.

#### FEDERAL FOREST LAND BANK

Congress should authorize the organization of banks to finance the business of growing and harvesting trees. If possible, the twelve existing federal land banks should handle this business,

not only because of the advantages of decreased overhead and an already functioning organization, but because they represent over half of the forest land owners, holding one-third of the nation's forest land.

In any event, the law should be patterned after the existing Federal Farm Loan Act. Briefly, this law would permit owners to borrow up to 50 per cent of the appraised value of their property, at an interest rate not to exceed 6 per cent. The loan would be secured by a first mortgage and would run from 5 to 50 years. The owner would be required to subscribe for stock in his local loan association equal to 5 per cent of his loan.

#### FORESTATION LOANS

Provisions not paralleled in the above-mentioned law must also be enacted. All property subject to measurable risks such as fire, disease, etc., must be covered by adequate insurance. A working plan, not necessarily a sustained yield plan, must be filed with each application. However, to encourage sustained yield management the banks should be authorized to make a special class of loans, forestation loans, covering only the reasonable costs of initiating a new crop. Forestation loans would be secured by a first mortgage on the *land* and the young trees which must be *fully* secured by insurance. Unless the premium is prepaid for the length of the loan, the bank would add it annually to the face of the loan. These loans would run until the trees are harvested, not to exceed 50 years. The interest rate would be similar to that prescribed in the Agricultural Marketing Act, 71st Congress, in brief, the lowest rate of



yield on any government obligation and may not exceed 4 per cent per annum.

Forestation loans are an emergency measure and their issue should be limited to the present forest crisis, probably 20 to 50 years, to be specified in the law. The forestation bonds, issued on the security of the forestation loans and so called to distinguish them from the other forest bonds issued by these banks bearing a higher interest rate, will be purchased by the Treasurer of the United States at par when tendered if not absorbed by the investment market.

#### FOREST INSURANCE

The Federal Forest Bank should have the authority where no *adequate* insurance facilities are available to assist in organizing a coöperative forest insurance association. Such an association would be independent of the bank, writing forest insurance on all property desiring such coverage.

#### MARKETING

While the Federal Farm Board should be urged to give adequate consideration to forestry under all of its power, it should stress (2) and (3) of Section 5,—encouraging coöperatives and securing reports on prices, supply, and demand. This work should be coördinated with somewhat similar work of other governmental agencies.

#### NATIONAL FORESTRY BOARD

Congressional action should set up and finance a National Forestry Board, consisting of one representative of each such state board in addition to the Forester of the United States Forest Service, acting as chairman. The Board should meet once a year, or, when necessary,

more often for the purpose of coördinating all the forestry activities of the nation.

#### FORESTRY CONGRESS

In order that the attention of the nation may be focused upon the forest problem and efforts to secure an adequate forest policy auspiciously inaugurated, President Hoover should call a forestry congress.

#### STATE CONSTITUTIONAL PROVISIONS AND WORKING PLANS

Every state constitution should contain a clause stating that as the natural resources are the heritage of its people, these resources must be kept in a reasonable condition of productivity. Probably no state has reached the point of generally restricting private forest property rights, but they should require every owner of unimproved forest land not in operated farms to file with the state forester a working plan for his property within two years, or the state will prepare one, levying the cost against the property.

#### STATE FORESTS

These working plans, besides being a powerful persuasive weapon, would aid in locating state forest acquisition units. States should build their acquisition program around existing state forests and land secured by tax title either direct or by purchase from the political unit holding title. These holdings should be consolidated by purchase and managed for the public benefit. Local communities should be reimbursed for revenue losses by a plan similar to that followed in respect to the national forests with a state loan privilege as suggested.

Although more efficient management is to be expected from the state, smaller governmental units should be encouraged to acquire and manage non-productive areas not susceptible to federal or state management. The state forestry department should furnish such communities with technical advice in the handling of these tracts.

#### STATE AND PRIVATE FOREST PROTECTION

After the state has fully met its share of the protection costs, usually considered as 25 per cent of the total, laws should be enacted requiring forest land not protected by the owner to pay a forest protection special assessment which should be increased as rapidly as is politically expedient until it equals 50 per cent of the total protection costs. This assessment is to be expended by the state forester and coöperators. The state should have the right to maintain permanent protection improvements (fire lines, etc.) upon unimproved land.

#### RURAL REORGANIZATION

All states should enact legislation looking toward the complete reorganization of the financing and administration of rural political communities, so that the governmental burden may be lightened and thus be more comparable with that borne by other forms of property. The brevity of this essay permits only the mention of more important reforms that must take place: (1) Abolition of local school and road districts; (2) one unit of rural government below the state, its boundaries determined on social and economic bases; (3) the technical administration of this unit under one executive head appointed by the people of that unit through an elective

board from among those having technical qualifications; (4) major school and all through highway costs financed by the state; and (5) broadening the state tax base to include a personal income, a business tax, and special taxes for specific purposes as recommended by the National Tax Association.

Such a reformation cannot be completed immediately, but more equitable assessment of different types of property (where they are inequitable), the assumption of a much greater share of school and road costs by the state, broadening the tax base as suggested, and such economies in local administration as can be effected now, would all reduce the tax burden on forest land. An equitable tax law that would now relieve forest property and that has a chance of being enacted in the near future is one that would ignore for purposes of taxation all *future* grown crops until they are sold by the producer who should be subject to an income tax.

#### RURAL ZONING

The state should enact legislation legalizing county zoning ordinances, and it should authorize its experiment station to prepare for demonstration purposes zoning plans for specific counties. It should also authorize its experiment station to prepare such plans for counties upon request, the state to pay one-half the costs.

#### STATE FOREST RESEARCH AND EXTENSION

The state should engage primarily in forest research that tends to apply the fundamental principle developed by workers throughout the world to the conditions within the state. Secondly, the extension effort must be ample to



insure that the solutions are practiced by the taxpayer. The states must not only increase their efforts in both these directions but must strike a balance between the two activities; research must not run too far ahead of practice.

#### VOCATIONAL TRAINING

The states within forest regions should provide schools similar to trade high schools, to educate artisans who can execute instructions from professional foresters.

#### STATE FORESTRY BOARD

Each state should create and finance a non-political State Forestry Board composed of representatives of all

groups interested in forest activities. Each group would select its own representative. The Board would coördinate all forestry efforts in the state and coöperate with the National Forestry Board.

#### PROFESSIONAL LEADERSHIP

An aggressive, foresighted, and intelligent technical leadership is necessary if these or any other remedial measures are to solve quickly and adequately the forest problems of the nation. The Society of American Foresters and the American Forestry Association can supply this leadership if they will triple and double their respective incomes.

## PLAN FOR THE RECREATIONAL DEVELOPMENT OF MOUNT OF THE HOLY CROSS REGION

By HAROLD L. BORDEN AND FRED R. JOHNSON

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This article supplements the May number devoted in large part to recreational forest uses. Presented as an actual plan of developing a recreational area it offers a good example of the mechanics involved in plan preparation.

THE recreational unit as here described and outlined on the map, comprises the region tributary to the Mount of the Holy Cross, on the Holy Cross National Forest. It has world-wide fame due to the existence of a well defined Greek cross on its north-east slope. The cross is formed by deep fissures which carry ore veins. During most of the year these fissures are filled with snow thus emphasizing the cross in greater contrast with the adjacent mountain side. The post of the cross is about two thousand feet in height and the cross arm measures several hundred feet. It is a natural recreational unit by reason of the religious associations connected with the cross and because of topographic barriers, fishing, and scenic attractions. The cross in itself is not sufficiently accessible to draw people in large numbers. However, the unit, with its excellent fishing and rugged scenery, when properly developed and supplied with adequate accommodations, will command the attention which it merits.

The plan for the organization of the unit provides for two phases of development; first, the development of the region centering around the Mount of the Holy Cross and Notch Mountain. The ruggedness of this country, even though it has been made accessible by a

fair system of trails, has limited the number of visitors. A wagon road which branches off the Tennessee Pass Highway (U. S. 40 S), about four miles south of Minturn, goes to Camp Tigiwon, the headquarters of the Mount of the Holy Cross Pilgrimage Association. From this camp, which is about four miles from the summit of Notch Mountain, there is a horse trail to a point about one mile from the summit. The last mile to the Notch must be made on foot. Trails easily accessible from this camp lead to the Mount of the Holy Cross and to the lakes and fishing streams shown on the unit map, also to Red Cliff. This development, therefore, will provide ready access to the Mount of the Holy Cross region for those who are willing or able to travel on foot or by horse to the various points of interest. It will provide for those who wish an intimate view of the cross and who are hardy enough to undergo the physical exertion to reach it.

To further supplement and enhance the religious and recreational values of the Holy Cross region and to protect the cross and its immediate surroundings from despoliation through mineral entries, and otherwise, the Forest Service, with the approval of the Smithsonian Institution, recommended to the Secretary of Agriculture that this area be



made a National Monument. The formal proclamation of the President, dated May 11, 1929, creating the Holy Cross National Monument, is given in the appendix of this plan.

The second phase of development plans to make the cross accessible to the mass of the people who are unwilling or unable to undergo the physical exertion necessary in viewing the cross from Notch Mountain. This development is dependent upon the building of the uncompleted portion of the "Holy Cross Auto Trail" from Wheeler to Red Cliff. This development will center around the place designated as the "Shrine" of the "Mount of the Holy Cross," an area designated by the Secretary of Agriculture on October 28, 1922, for recreational and devotional purposes. The cross is seen to best advantage from the "Shrine" which is located on the upper limits of Turkey Creek, a distance of about seven miles N 62 degrees E, from the cross. This bearing passes through the notch on Notch Mountain. This mountain is about one mile east of the Mount of the Holy Cross and it cuts off the view of the cross except from high elevations or through the notch. This place known as the "Shrine" was found after many years of search by O. W. Daggett and it will be the center of the development after the above mentioned highway is completed.

#### SPECIAL POLICIES

The special policies that will govern the recreational use of this unit and which are supplemental to the standard recreational policies of this Region of the Forest Service, follow:

##### 1. *Economic Uses and Recreation.*

Timber cutting has been in progress on portions of this unit for fifty years and taken as a whole is the dominant use. Sheep have been grazed on it, especially at the higher altitudes, in more recent years. With the development of the agricultural resources in the Colorado river valley, water is becoming more valuable. Neither use, when supervised properly, interferes with the value of the forest in the Eagle river drainage for watershed protection or for recreation.

In the lower portions of the unit, timber production and watershed protection are dominant. In the upper portions, except the Holy Cross National Mounment and the Shrine of the Mount of the Holy Cross, grazing is dominant. Recreation is dominant on the Monument and the Shrine. With the development of the recreational uses of the region recreation will increase in value until it will be on a par with all other resources. This plan aims to harmonize all uses so that they may be carried on without interference with each other, and particularly to assure that the social values are fully protected. A considerable part of the unit lies within a mineralized zone and is subject to mineral entry. Mining is, however, on the decline and entries and patents are few.

2. *Grazing.* No conflicts exist at present between grazing and recreation. The region covered by this unit plan is used by approximately 9,000 head of sheep owned by three permittees with established preferences. There are no cattle within the area and no prospects of any.

Sheep are handled so as to be under

control at all times and should recreation develop to a point where grazing interferes, the situation will be adjusted in favor of recreation as a dominant use.

The area immediately surrounding the cross is exceedingly rough and rocky and is not grazed at all. The balance of the unit where recreational development is contemplated, as for example on Turkey, Homestake, and Fall creeks, contains a high percentage of bunch grass which will either permit of a dual use, or if necessary sheep can be restricted from these areas entirely without making it necessary to reduce established preferences.

3. *Timber Management.* During the early days of the mining boom in this region, large amounts of timber were cut. In some places clear cutting was practiced. However, good reproduction has come in on most areas except in portions of the spruce-fir type. Since the Holy Cross National Forest was established, timber has been cut more conservatively, and there has been a steady demand to supply the local mining industry. With the contemplated expansion of the Empire Zinc Company operations, there will be a larger demand for timber. This can be supplied perpetually, as outlined in the management plan for the Upper Eagle River Working Circle, without detriment to recreational values.

Timber will be cut according to the approved marking policy statement of the Holy Cross National Forest. Scenic values will be preserved around lakes, highways, camp grounds, and other recreation areas by removing only the dead, insect infested and diseased trees,

and only such other trees in need of removal as can be spared without marring the beauty of the setting. The lakes in this unit are located above timberline or in the sub-alpine type where there will be no cutting. The Mount of the Holy Cross Monument is above timberline. The Shrine consists of mountain meadows and scattered stands of timber which were cutover and partly burned about forty years ago. Some young growth has come in. The only large body of merchantable timber in the unit is on Homestake creek and the conservative cutting of this tract will not interfere with the recreational use of the unit. A conservative system of cutting, such as is now being followed, will enhance rather than detract from recreational values.

4. *Fish and Game.* No active fish and game associations exist within the unit, the nearest being at Minturn, just outside and below the unit.

Excellent coöperation has been secured in the past from local residents in planting fish fry received upon requisition from the Leadville and Glenwood Springs hatcheries. It will be the policy to continue this coöperation and increase the planting of fry to a point that will keep all the streams and lakes within the unit fully stocked.

The above plan together with the fact that there is very little private land along the streams and lakes assures plenty of public fishing within the area. No private monopolies of fishing privileges will be allowed except for artificially constructed ponds, under permit.

5. *Fire.* All campgrounds within the unit will gradually be improved and fire-proofed and visitors will be encour-



aged to camp only at these points.

6. *Sanitation.* As funds become available and use requires, all campgrounds listed in the plan will, as a minimum requirement, be equipped with fire places and flyproof toilets and garbage pits. These are listed in the budget.

7. *Special Dedication.* As brought out on the first page of this plan, an area known as "The Shrine" has been designated for recreational and devotional purposes on the upper limits of Turkey Creek. The development of this area must be delayed until the location of the "Holy Cross Trail" from Wheeler to Red Cliff is definitely determined and road construction is started. Then steps should be taken by the Mount of the Holy Cross Association and other non-sectarian bodies, working under the direction of the Forest Service, to develop a community center for religious gatherings and recreation. All improvements in the amphitheatre facing the cross shall be for the use of all denominations, individually or collectively, under a system to be worked out jointly by the Holy Cross Association and the Forest Service. The improvements around the amphitheatre should be erected by the association as a non-sectarian body from public subscription to prevent any denomination from monopolizing the place. Congress has appropriated no funds for improvements of this nature, but the Forest Service will assist in the protection and sanitation of the area. Before the shrine is developed, a detailed plan will be prepared by the Forest Service in coöperation with the association. This plan will show the location and nature of the community improvements, including the

amphitheatre and the campgrounds. In addition, provision will be made for such resorts, stores, filling stations, and the like, as are necessary for the convenience of the public.

The foregoing provision for a common religious center will not preclude the use by any denomination or organization, on days set apart for them, of any paraphernalia or equipment needed by them in their services. Nor will it preclude the erection under permit of such buildings as are considered necessary by any denomination for holding indoor services or as headquarters for their work. Such buildings will be located away from the joint community center and amphitheatre in places to be selected by the Forest Service.

When the state highway, known as the Holy Cross Trail, is built from Red Cliff to Wheeler, the cross can be seen by large numbers of people from the vicinity of the shrine. The area has been dedicated to public use and is the logical center for religious meetings for the largest number of people. This is due to its accessibility and convenience compared to the more rugged portions of the region. The use of the shrine, as outlined in this statement of policy, will be recognized in this plan.

The Holy Cross National Monument was not specifically created for recreational and devotional purposes, but for the protection of the mountain of that name. It will, however, be used mainly for religious pilgrimages and by tourists who wish to enjoy a close view of the cross. This area will be retained in its natural condition and no uses or improvements will be permitted on it, except trails that are needed to make it

accessible, and such shelters, as may be necessary on Notch Mountain for the protection of life or for holding religious services.

This area, by reason of its altitude, ruggedness, dangerous lightning and snow storms, and wind, is more adapted to people accustomed to mountain climbing than for use by the masses. The topographic and climatic conditions will interfere considerably with holding religious services on Notch Mountain. However, the Pilgrimage Association is confident that the pilgrimages will be successful. The Forest Service will encourage the pilgrimage idea so far as it is compatible with its general policies. It, of course, looks to the organization to conduct pilgrimages in a business-like and non-sectarian manner. As is brought out later, the association will maintain Camp Tigiwon and most of the tourists will be accommodated there. The plan provides for installing such additional sanitation and protection improvements as are necessary for the accommodation of the public. These will be installed as funds are available and the travel requires. It will be the policy of the Forest Service to concentrate its effort on making the region more accessible with a good system of trails, and to provide the necessary sanitation and protection improvements.

Shelters or churches erected within the Monument must be substantial structures of stone. This is necessary because it is considered the most satisfactory material for withstanding the severe climatic conditions of this high altitude. There is an abundant supply of stone at hand, no expensive transportation is involved, and it is in harmony

with the surroundings. For obvious reasons, no temporary shacks will be permitted. The location of and the plans for any improvements which the association proposes to erect within the Monument must be approved by the Forest Service prior to starting construction.

8. *Improvements.* Buildings erected on this unit will be of log or stone except on the lower portion adjacent to the auto highways where slab siding or lumber may be used for construction. The location of all improvements on community tracts will be marked on the ground by the Forest Service before construction work begins. A detailed plan for the development of Camp Tigiwon has been made.

#### TRAFFIC SYSTEM

The existing road system traversing the area includes highway U. S. 40 S, locally termed the Tennessee Pass Highway, and the Homestake Forest Development Road into Gold Park.

The proposed road known as the "Holy Cross Trail," which in its entirety constitutes a short cut from Denver to the Western slope via Loveland Pass, Dillon, Red Cliff, was designated a state highway several years ago. While favorable action has been taken on sections in the vicinity of Silver Plume, Loveland Pass, and Dillon, nothing has been done on the Turkey Creek-West Ten Mile section and the construction of this is essential before any development and use can be made of the area set aside as the Shrine.

While there is a certain class of people who enjoy roughing it, and desire to get back into the by-ways where it means going on foot or horseback or





both, over rough, precipitous country, by far the greater majority of the people prefer to go only where they can drive their cars. At the time the area at the head of Turkey Creek was set aside by the Secretary's order as a public service site for religious and recreational purposes, it was recognized that no development would be possible without the Holy Cross Trail highway. Therefore, in making up this unit plan it must be recognized that this road is necessary to the proper development of the region. The existing roads together with the one proposed will complete the road plan for the unit.

The present trail system makes accessible the scenic attractions, the lakes, and the streams, and is considered complete except for such sections as future use may show to be essential. The main Notch Mountain trail runs south from Camp Tigiwon to the Notch with branches to Cross and Fall creeks, and to Red Cliff. The trail is built for horse travel to the top of Notch Mountain. The last mile along the ridge to the Notch, is over rough boulders and is intended for pedestrians, since this portion of the ridge is too narrow and precipitous to accommodate any considerable number of people or horses.

The Bowl of Tears, at the foot of the cross, can be seen only from a point south of the Notch. To attain a point from which it is visible, it will be necessary to restore approximately two and one-half miles of the old Fall creek trail which was abandoned after the new one was built in the gulch. This leads to a high mountain meadow where horses can be left, and with the construction of one and one-half miles of foot

trail partially through slide-rock and partially through an alpine grassland type, the crest of a ridge south of the Notch is attained where an excellent view of the Bowl of Tears, as well as of the cross, may be had.

From a certain point along this trail at the crest of Notch Mountain ridge, hardy mountain climbers can proceed around the amphitheatre at the head of the branch of Cross Creek which flows directly in front of the cross, and, by taking a uniform and not unduly stiff grade, ascend to the top of the Mount of the Holy Cross. No trail to the top of the mountain is contemplated in this plan of development. It is planned to leave this small area in its natural state so as to provide hardy mountain climbers, who will constitute the only class interested, the necessary thrill in making the ascent.

#### PRESENT AND FUTURE USE

The use of the Red Cliff District by recreationists during the past five years, shows the following patronage:

Campers and picnickers.....	1,534
Resort and "special use" guests	191
Transients .....	5,500

Total, average for five years... 7,225

These figures indicate that the largest use is by campers and picnickers who stop along the main highway or drive up the Homestake Road to Gold Park and then walk to the various fishing lakes. The transients drive through the unit on the Tennessee Pass Highway and make no use of the area.

An important factor in the development of this unit will be the building of the Red Cliff-Wheeler road. This project has been discussed for ten years.



When it is finally started a detailed plan for the development of the Shrine will be made.

Another factor of importance in the development of the recreation uses of the region, is the need for a man of energy to start a horse livery and guide business at Red Cliff and Minturn, to take people to the Cross and to the various high-altitude fishing lakes.

A third factor is the progress which the Mount of the Holy Cross Pilgrimage Association will make in advancing the pilgrimage idea and in developing Camp Tigiwon.

The region at present is used principally for fishing and mountain climbing. Motoring is largely by through travelers. If the unit is developed along the lines indicated in this plan religious meetings will constitute one of the largest uses.

#### 1. PUBLIC USE:

##### a. *Camps and picnic grounds.*

The camps essential for handling the public are listed in the budget and these will be developed as the need arises. The only camp that has been developed is that along the highway, U. S. 40 S, near the mouth of Homestake creek. The greatest need for a public camp is at Gold Park which is the center for trips to the Homestake, Missouri, Hunky Dory, Whitney, and other lakes. Gold Park is unused patented land and people camp at any place with no restrictions as to sanitation. The budget provides for a camp on government land in Gold Park and an effort will be made to have land owners control the camping on their land.

Camp Tigiwon, which is located about eight miles from Minturn or

about four miles from the Eagle river valley, is the headquarters of the Mount of the Holy Cross Pilgrimage Association. In 1928 a wagon road was constructed from the valley to the camp; toilets, garbage pits, and a water system were installed; and a headquarters building and post office was erected. Tents, bedding and meals were provided at cost by the association during the pilgrimage which lasted one week. Since this plan does not contemplate any federal aid on the proposed road to Camp Tigiwon and since the camp has been developed at the expense of the association, and since the association has a charter as a non-profit making corporation, a free permit was issued with the understanding that the association may charge the public cost prices for facilities provided at this camp.

#### 2. SEMI-PUBLIC USE:

##### a. *Clubs, churches, lodges.*

No uses of this kind are contemplated in this unit other than the use by the various denominations of the amphitheatre to be erected at the shrine by the Holy Cross Association. This amphitheatre should have the necessary seating space, pulpit and choir accommodations, similar to those in the Denver Civic Center. It is important to keep this place non-sectarian. Nothing but confusion and friction would result if each denomination were allowed to erect its own structure facing the cross. There is plenty of room around the amphitheatre for church buildings, hotels, and individual cabins, provision for which will be covered in the detailed plan.

##### b. *Commercial uses.*

There are no resorts in the unit and the only hotel that has accommodations

for tourists is Shrine Lodge at Red Cliff. This hotel has twenty rooms for guests and furnishes meals.

This plan provides for a cabin resort at Gold Park. It will probably be on patented land although government land will be available in case this proposition does not materialize. Gold Park is the logical center for fishing and pack trips to Homestake, Missouri, Fancy, Hunky Dory, Whitney, Constantine, and numerous other lakes. The Notch and Holy Cross Mountains can also be reached from here. The resort should have a lodge with living and dining rooms, and cabins with accommodations for two or four people each. The guarantee of an attractive and complete development will be required. There is sufficient patented land for pasture for the necessary saddle stock.

The plan further provides for cabin camps of a much more simple nature for over-night stops of pack outfits at lakes Constantine and Missouri. These cabins will obviate the necessity for packing bedding and cooking equipment. They are to be located on government land in the shelter of the timber and above the marshy land close to the lake. A schedule can be arranged by the resort company for one to four day trips, depending on the amount of time that people wish to spend at the lakes. The cabin camp at Constantine lake would also be open for pack outfits from Red Cliff, who could come via the Holy Cross and Fall creek trails.

### 3. PRIVATE USE:

The only sites suitable for summer homes at present are located on Homestake creek adjacent to Gold Park. There have been no demands for sum-

mer homes here and none are anticipated, especially if the proposed cabin resort is established at Gold Park.

After the route of the Holy Cross trail is determined arrangements will be made to locate at least two groups of summer homes. One should be on Middle Turkey creek where the Holy Cross can be seen and the other will be close to the Shrine so that people desirous of participating in the religious programs will be conveniently located. The standard practice of concealing the cabins from the road will be followed.

### UNIT MAP—EXPLANATION OF ALLOCATION

The map prepared on a scale of one inch to a mile together with the budget constitutes the plan for the unit. The map explains the allocation of land for different purposes. The plan provides for no development on the upper portion of the Cross creek drainage because of its altitude, ruggedness, and difficulty of access. The lower portion of Cross creek is not included in the unit because its scenic and fishing values are not high, and because the town of Minturn takes its water supply from this stream and, having no chlorination plant, does not wish to have the stream used. Lower Cross creek is not essential to the plan. A small map of the Monument is also a part of this plan.

### SUPERVISION

The district ranger is required to make one inspection of permitted use areas annually in accordance with the standard of the Holy Cross National Forest. Follow-up inspections will be made when necessary. Campgrounds in the Holy Cross region are to be policed



## BUDGET OF UNIT IMPROVEMENTS:

(a) Roads—See Traffic System.

(b) Trails—Existing and Planned.

Name and Map Number	Termini	Class	Total Length miles	Miles to be rebuilt	Estimated cost Dollars	Remarks
Fall Creek (30)	Notch Mtn. Park-Holy Cross city	Sec. & Way	6	—	—	Secondary to Lake Constantine.
Homestake Lake (31)	Gold Park-Homestake Lake	Sec.	4	—	—	Homestake Falls enroute.
Holy Cross Mountain (32)	Red Cliff-Cross Creek-Rest Cabin	Sec. & Way	12	—	—	Secondary to Notch Mountain Park.
French Creek (33)	Gold Park-Cross Creek	Way	6	—	—	Rest cabin for use of people climbing the Mt. of Holy Cross located at terminus of this trail.
Missouri Creek (34)	Gold Park-Cross Creek	Way	6	—	—	Holy Cross city-Fancy Lake enroute and Fancy Pass, Savage and Carter Lakes, and side trails.
Fancy Creek (35)	Missouri Creek-French Creek	Way	5	1	50	Missouri Lake enroute.
Whitney Lake (36)	Homestake Creek-Whitney Lake	Way	6	3	300	To be extended down to Lake Constantine.
Piney Creek (42)	Turkey Creek-Two Elk Ridge	Way	4	—	—	
Turkey-Lime-Willow (43)	Turkey Creek-Two Elk Ridge	Way	11	—	—	
Notch Mountain (44)	Halfmoon Pass-Notch	Way	3.5	—	—	One and one-half mile foot trail. Completed in 1929.
Turkey Creek (45)	Red Cliff-Shrine	Way	6	—	—	Route proposed Holy Cross Trail Highway.
Bowl of Tears (46)	Fall Creek Trail-Bowl of Tears	Way	4	4	500	Construction and reconstruction.

# PLAN FOR RECREATIONAL DEVELOPMENT

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Name and map Number	Location	Special Features	Toilet	Fire place	Garbage pits	Water	Fire proof	Area Acres
Homestake* (1)	Two miles south of Red Cliff on Highway U. S. 40 S.	Excellent evergreen grove; good water, level, short distance to town.	2	2	2	—	—	3
Gold Park (2)	Eleven miles up Homestake Creek from Red Cliff	Starting point for side trips. Fishing; level, evergreen grove, good road	2	2	2	—	Fire Line on upper side	2
Tigivon <sup>b</sup> (3)	Eight miles southwest of Min-turn	Outfitting point for trips to Cross Bowl of Tears, and Lake Constantine. Some improvements built in 1928.	4	2	2	spring devel-oped	—	2
Notch Mtn. (4)	Junction Holy Cross Mtn. and Falls Creek trails, six miles southwest to Red Cliff	Convenient spot from which to take in Cross, Bowl of Tears, and Lake Constantine	1	1	1	—	—	1
Homestake Lake (5)	Four miles up Homestake Creek from Gold Park	Excellent lake fishing. Good view	1	1	1	—	—	1
Hunky Dora Lake (6)	Four miles northwest of Gold Park	Lake fishing	1	1	1	—	—	1
Missouri Lake (7)	Five miles up Missouri Creek from Gold Park	Fishing, mountain climbing, base for trips to Carter and Savage lakes	1	1	1	—	—	1
Constantine Lake (8)	Head of Fall Creek ten miles southwest from Red Cliff	Fishing. Base from which to reach Cross and Bowl of Tears	1	1	1	—	—	1
Shrine* (9)	Seven miles up Turkey Creek from Red Cliff	Perfect view of Cross	2	4	4	2	—	10
Turkey Creek (10)	Four to five miles up Turkey Creek from Red Cliff	Along Holy Cross trail highway midway between Red Cliff and Shrine	2	2	2	—	—	1

a. One toilet, garbage pit, shelter cabin, and 2 fire places, built by Forest Service in 1921, to be rebuilt in 1931.

b. This has been designated a campground to be developed by Holy Cross Association under Special Use without profit. Cabins may be built later.

c. Amount of development dependent upon use of area.

d. Essential signs on all trails leading to camps; tourist registers at the most heavily used camps.



(d) Resort Sites.

Name and Map Number	Location	Kind of Use	Remarks
Gold Park (B-1)	Eleven miles from Red Cliff on Homestake road	Cabin camp, 6-10 cabins; dining room, horse livery	Proposed because of large use of this area. Best site on patented land.
Constantine Lake (B-2)	Head of Fall Creek, ten miles southwest of Red Cliff	2-4 cabins for pack outfits	Proposed for resorts outfitting from Red Cliff or Camp Figiwon.
Missouri Lake (B-3)	Five miles up Missouri Creek from Gold Park	2-4 cabins for pack outfits	
The Shrine (B-4)	Seven miles from Red Cliff on Turkey Creek	10-20 cabins, restaurant, store, filling station	Dependent upon use made of this area and church development.
Shrine Lodge (B-5)	Town of Red Cliff	20 rooms, and meals	Private land.

(e) Summer Home Groups—listed in order of their need for survey.

Name and Map Number	Location	Estimated Number Lots	Record of Survey	Remarks
Gold Park (A-1)	Adjacent to and below patented land in Gold Park	10		
Turkey Creek (A-2)	On "Holy Cross Trail" one mile below Shrine	10		Dependent upon building of this State Highway.

(f) Other Improvements.

Nature and Map Number	Location	Remarks
Chapel (C-1)	Where trail first reaches summit of Notch Mountain and first view of Cross is had	Stone chapel and shelter proposed by Mount of Holy Cross Pilgrimage Association.
Amphitheatre at Shrine (C-2)	Seven miles from Red Cliff, on Turkey Creek	Open air amphitheatre for services with cross in background. Cleanup of dead and down timber necessary. Possibly church buildings also under permit.

and inspected at least twice during the season, with more frequent visits, if necessary.

Surveys of organizational and commercial use sites will be made by the Forest Supervisor or his assistant. In the development of the Shrine and the Monument assistance from the Regional Office will be provided.

The Forest Service will coöperate with the Holy Cross Association, the Pilgrimage Association, the Colorado Association, and other organizations interested in the development of the Holy Cross region. When approved by the Regional Forester, the general policies for the development of the region will not be changed without consulta-

tion with the interested organizations. The Supervisor will proceed with working out the details in accordance with the plan.

Such revisions of this plan as are considered necessary will be taken up at the close of the first five year period—January 1, 1934.

The appendix<sup>1</sup> contains the proclamation by President Hoover, dated May 11, 1930, establishing the Mount of the Holy Cross Monument; the proclamation of the Acting Secretary of Agriculture, dated October 28, 1922, establishing the Shrine of the Holy Cross; and information on recent developments around the Cross.

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<sup>1</sup> The appendix is omitted for brevity, as is also copy of the major map.—*Ed.*

## COMMENTS ON

### AN EXAMPLE OF FOREST TAXATION IN NEW HAMPSHIRE AS COMPARED WITH AN EXAMPLE IN SWEDEN, BY J. W. TOUMEY AND ERIK LINDEBERG<sup>1</sup>

By LOUIS S. MURPHY

*Forest Taxation Inquiry, Forest Service, Washington, D. C.*

Mr. Murphy emphasizes the differences in market value depending on whether or not a forest property is managed on a sustained yield basis. He believes that since the bad market value situation is the result of a bad forest situation, the forest owners themselves have it in their own hands to cure both. He also calls attention to the considerable difference in cost of government in New Hampshire and Sweden and how it affects the tax rate.

JUDGED by the undertone of the article by Toumey and Lindeberg the compulsory practice of forestry could be made to play no small part in the solution of the forest tax problem. In fact it does just that in Sweden although it is not so credited by the authors in so many words. Taking the authors' words at their face value, however, let us see what they imply.

To begin with, it is said that:

"Were the American example normally stocked with age classes comparable with those in the Swedish example the assessed value . . . . would not be less than \$75,000 under existing conditions." (Page 208, and paragraph 1.)

Of these "existing conditions" two are worthy of note, namely, the current manner of taxing forest property, on the one hand, and the value of such property based on the prevailing manner of handling it, on the other. As to the first, we read:

"Forest property in New Hampshire is taxed under the laws relating to the taxation of real estate. . . . The statutes provide that forest land and

growing forest shall be assessed at its full market value and shall pay the same rate as other real estate." (Page 207, beginning paragraph 1.)

"Market value" of forest property is evidently the key consideration of the tax phase of "existing conditions." As to the other important phase of "existing conditions," *i. e.*, the value of forest property due to the prevailing manner of handling it, we read:

"The market values of forest properties in Southern New Hampshire bearing immature but merchantable timber . . . . are usually excessive as they are not based on the yearly or periodic production of the forest *but on the market value of the forest capital that chances to be on the property at the time being.* If the forest owner, as in Sweden, were not permitted to reduce his forest capital over much below that of the normal forest but must depend upon sustained growth for receipts from his property, the market value of forest property would likely be much less than it is today." (Page 200, middle, paragraph 3.)

At the beginning of the paragraph preceding the one just referred to we read:

"The Swedish laws which regulate

<sup>1</sup> JOURNAL OF FORESTRY, V. 28, No. 2, Feb., 1930, pp. 199-211.



the cutting from private forests do not permit undue overcutting. In effect, the requisite forest capital must be maintained and only the wood equivalent to the growth from time to time removed. The price paid for forest property in Sweden bears a close relation to the value of the yield. . . . Due to this cutting restriction . . . the capitalized value on which the price of forest property (forest land and standing timber) is based may be actually less than the market value of the merchantable timber would be if the owner were permitted to remove the timber at once and devastate the property as he can under the New Hampshire laws." (Page 200, paragraph 2.)

Finally, at the end of the paragraph following that just referred to we read:

"As the purchaser of forest property in this region (New Hampshire), however, must often pay more than it is worth as a going forestry business, economically he is forced to cut the timber soon after its purchase, which leaves the land devastated and with little hope of further income from the sale of forest products for many years."

Thus the article makes it clear that the amount of market value of a forest property may differ widely depending on whether the property is in a country where all owners are required to practice forestry, as in Sweden, or where all owners are left free to exploit their forests, and the great majority of them do so, as in New Hampshire and all of the other American States. Concretely the annual sustained yield forest in Sweden has a market value for forestry of \$36,936, whereas the same forest would have a market value for exploitation in New Hampshire of \$75,000 according to the article. If, however, New Hampshire should follow the lead of Sweden and require of

all owners the practice of forestry, then market values would necessarily readjust themselves as in Sweden to a forestry régime basis.

Let us first see what this would mean to the Swedish normal forest if moved into the New Hampshire jurisdiction. The assumed yield per hectare per annum is 3.5 cubic meters (indicated at the bottom of page 201 of the article as "soil quality 3.5") or approximately 0.5 cords per acre per annum. At the assumed stumpage value in Sweden of 6.5 crowns per cubic meter the annual gross income per hectare would be 22.75 crowns equivalent to \$2.49 per acre or at the rate of \$5 per cord for the 0.5 cord. In this connection the article indicates (end paragraph 2, page 200) that at the Yale Forest in New Hampshire stumpage averages but \$4 a cord or \$1 less than the indicated Swedish price. The two are perhaps close enough, however, so that we may proceed on the Swedish basis for the present.

In the Swedish process of capitalization 25 per cent of the gross income is deducted for expenses including taxes and the net income resulting from that deduction is capitalized at 5 per cent. (This capitalization procedure is not shown in the article but is the basis for computing the values given in "Table 1 of the above-mentioned instructions" referred to at the top of page 202. However, at the end of the paragraph following that just indicated, an attempt is made to show a capitalization relationship between the value of the property as derived from the official table and the income subject to the excise and local income taxes. This is an altogether misleading and spurious relationship.) Carrying

out the indicated capitalization, the 25 per cent deduction from the assumed gross income of \$2.49, which is 62 cents, leaves a net income of \$1.87 subject to capitalization at 5 per cent giving \$37.40 as the value per acre of the land and growing stock. (The article shows \$37.39 of which \$6.56 is land value and \$30.83 is growing stock value.)

The article indicates (Table 5, page 206) a total tax burden of 42 cents per acre. If that amount is deducted from the 25 per cent of gross income allowed for all expenses, namely, 62 cents, the difference, or 20 cents, would be the amount available for all expenses incidental to protection and management.

The article further indicates that the tax rate in Swanzey, N. H., where the Yale Forest is located is 3.45 per cent. That rate is probably based on a total value for the town of perhaps two-thirds of its full value. On that basis the indicated rate on full value would be 2.3 per cent. Applying that indicated full value tax rate to the per acre value of the Swedish normal forest the tax burden that would be imposed on such a forest in New Hampshire would be 86 cents instead of 42 cents as in Sweden. This difference can be due to nothing else than the difference in the cost of government in the two places since the Swedish tax system is of no pecuniary advantage particularly to the normal forests,<sup>1</sup> a forestry régime has been

assumed under which the market value in New Hampshire would be the direct function of annual income as in Sweden and the tax rate has been adjusted so as to approximate a full value basis.

Under these circumstances taxes alone would represent nearly 35 per cent of gross income and with the 20 cents allowed in Sweden for other than tax costs the total expenses would become \$1.04 or 42 per cent of gross income. This amount deducted from the gross income of \$2.49 would leave a net income of but \$1.45 which obviously would not capitalize at 5 per cent to \$37.40, but only to \$29. The readjusted true value of the Swedish normal forest property due to local New Hampshire tax conditions must, therefore, lie somewhere between these two amounts.

How would this readjustment in value normally be effected? Clearly the problem is to find a capital which will yield a 5 per cent net return from the same gross income after the payment of all expenses including taxes, *i. e.*, a 2.3 per cent tax as before and 20 cents for management and protection. Suppose now that we let  $x$  represent such a capital. The amount of net return would then be represented as 5 per cent of  $x$ , or  $.05 x$ , while the taxes would be 2.3 per cent of  $x$ , or  $.023 x$ . Now these two unknown amounts, net income and taxes, together with the 20 cents for management and protection make up

<sup>1</sup> Briefly, all the Swedish tax system actually does is to take the usual property tax in two bites, as it were. The first bite consists in the regular property tax levied on 72.5 per cent of the full normal forest property value, leaving the remaining 27.5 per cent (*i. e.*, 1/3 of the growing stock value) for the time being untaxed. The second bite consists in levying later in the same year excise and income taxes which are so integrated with the property tax through rate capitalization that the income from the 27.5 per cent of property value is taxed an equivalent amount to that of the property tax it did not have to pay. Since the property tax value is based on the capitalization of *assumed* yield, while the excise and income taxes are based on *actual* yield, any inequity in the property tax due to misjudging the *assumed* yield tends to be compensated for in part at least by basing part of the tax on the actual yield. Accordingly, the statement above that "the Swedish tax system is of no pecuniary advantage particularly to the normal forest" seems fully warranted.

the gross income of \$2.49, which remains unchanged. Deducting the cost of management and protection, 20 cents, from the gross income leaves the difference, \$2.29, equal to the sum of the two unknown amounts, or  $.073x$ . Solving for the value of  $x$  we find it to be \$31.40, the value of the property readjusted to local New Hampshire tax conditions. Thus the net income would be \$1.57, instead of \$1.87, as in Sweden, and the taxes 72 cents, instead of 42 cents, the two together amounting to \$2.29 per acre. Accordingly the Swedish normal forest property, other things being equal—*i. e.*, the same cost of management and protection and the same *rate* of return under a forestry régime—would suffer a depreciation in selling value of \$6 (\$37.40—\$31.40), due to the higher cost of government under Swanzev conditions than under those in Sweden.

Now compare this full value of \$31.40 an acre for the Swedish normal forest under a forestry régime in Swanzev with the probable assessed value of the same forest under the existing exploitation régime, namely, \$76 an acre (shown in the article, on page 208, end of paragraph 2, as \$75,000 for 988 acres). Compare also the taxes per acre on these respective valuations, namely, 72 cents under the forestry régime<sup>2</sup> and \$2 under the exploitation régime.

We now come to a consideration of the sub-normal Yale Demonstration and Research Forest likewise under a for-

estry régime and identical local tax conditions. The article indicates that it has an annual gross income of \$640 for its 1,064 acres, or slightly more than 60 cents per acre (60.15 cents) compared with that of the normal forest of \$2.49.

What then is its net worth? The same cost per acre for protection and management as with the normal forest may be allowed, namely, 20 cents, although with a sub-normal forest these costs would probably be higher. However, without an adequate basis for estimating what such an amount should be the 20 cents may be taken as a minimum. Obviously any increase in that amount would reduce the value proportionately by leaving a smaller balance from gross income than 40.15 cents to cover the items of net income and taxes. These last named items, necessarily would bear the same general relationship to the true value of the property under a forestry régime as above shown in the case of the normal forest, namely,  $.05x$  for net income, and  $.023x$  for taxes or  $.073x$  for both combined. Thus solving the  $x$  as before the value of the sub-normal Yale Forest under a forestry régime would be \$5.50 an acre with a net income of 27.5 cents and taxes of 12.65 cents approximately.<sup>3</sup>

Compare this \$5.50 an acre property value under a forestry régime with the \$24.42 of assessed value under the present exploitation régime, as shown in the article (p. 208, paragraph 1). This indicates a depreciation of at least \$18.92 an acre, and more if the property is now

<sup>2</sup> It may be of interest to note incidentally here, that while this amount of tax would be levied entirely as a property tax under the New Hampshire tax system, it would be levied approximately 52 cents as a property tax and 20 cents as excise and income taxes under the Swedish tax system.

<sup>3</sup> The Yale Forest being sub-normal, the prospect of its increasing in earning capacity up to that of the normal forest would give it some enhancement in value over that shown, in the same way that a farm which has not attained its expected maximum earning capacity will have a somewhat higher present value than that warranted by its current earnings.



assessed at less than its full exploitation value as is quite likely. Such depreciation, however, is an essential one to the change from an exploitation to a forestry régime in order that the value under the latter may show the proper relationship to the property's true earning capacity based on the annual growth.

Theoretically, the changes in régime and resulting forest property value would effect a corresponding reduction in taxes on the Yale Forest as indicated, namely, to 12.65 cents an acre on the \$5.50 per acre value under the forestry régime as compared with 80 cents on the \$24.42 per acre value under the present exploitation régime. Furthermore this favorable reduction would take place without any change whatever in the property tax system other than that from a lax to a strict enforcement of the requirement of full value assessments of all property in order to make possible the one-third reduction in the tax rate which these calculations have assumed. It is undoubtedly true that if New Hampshire adopted a compulsory forestry régime many towns with a large amount of forestry property on the tax rolls at its present exploitation value would suffer a pronounced shrinkage in total valuation. This reduction in some cases at least would be too great to be offset even by the increase in assessed value of all other property to full value and thus leave the tax rate at its present level. An increase in tax rate would accordingly be necessary in those cases unless the State stepped in to make up the difference and thus stabilize the town's budget.

Before saying too much about the tax

system being responsible for the failure of forest owners to practice forestry had we not better be certain that the cause of the apparent difficulties here in America does not lie deeper, namely, in the forest economic system itself? Let me quote again the closing sentence in the group of quotations appearing at the beginning of these comments, giving the senior author's own views on the unfavorable economic situation, *viz.*:

"As the purchaser of forest property in this region, however, must pay more than it is worth as a going forest business, economically he is forced to cut the timber soon after its purchase, which leaves the land devastated and with little hope of further income from the sale of forest products for many years."

And let reference again be made to the two points that were emphasized at the beginning of these comments, namely, (1) that market value is the crux of the American tax situation and (2) that the market value of forest property having future wood production possibilities depends on what use is to be made of it. But forest owners themselves are the makers of market value when they buy and sell such forest property. Now, with the bad market value situation the direct result of a bad forest situation, *i. e.*, exploitation instead of a forestry use of the property, is the conclusion not inescapable that the forest owners themselves have it largely in their own hands to cure both the bad forest and the bad tax situations by concertedly setting their own houses in order? Or must the government do it for them as in Sweden by compulsory forestry regulation?

Think it over.

# PRIVATE FORESTRY

## SOME REQUIREMENTS AND OPPORTUNITIES

By H. L. CHURCHILL

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This article, prepared at the request of the editor, might be called a guide for those foresters who hope some day to manage a private forest property. Mr. Churchill, with long experience as a private forester, is particularly well qualified to suggest the course the forester in private employ should follow if he aspires to put his property on a permanent production basis.

THE CUTTING and removal of wood products from the forest and their further manufacture or preparation for final use, has for generations constituted one of the world's great industries. Wood in one form or another has been one of the most essential factors in building up civilization. I see today no valid reason why these tremendous forest and related industries should not continue so long as the earth remains the habitation of man.

Because of the tremendously aroused public interest in the forests of the United States and Canada for recreational and aesthetic purposes, as well as watershed protection, game and other wild life sanctuaries, grave doubts have become general as to whether or not the forests will be so handled in the future that they will continue to render their greatest service to mankind.

Evidently great changes must take place in the lumber industry, and these changes will require years of careful thought and deep study. Each region, each forest property, and each type is a problem in itself and mistakes in management are easy to make but difficult to correct. Both the technically trained forester, interested in private work, and

the owner of large tracts of forest land, need encouragement in solving wisely the problems they are now facing and those they will be constantly confronted by in the future. Possibly the present viewpoint of a man familiar since boyhood with general woods operations in the New England section, and for twenty years directly in touch with lumber and pulpwood operations in New York State and Quebec, may aid and encourage some others in getting and keeping a clearer vision ahead and putting increased energy and thought into their efforts for the permanent good of the forests, the forest industries and the forestry profession.

We have already passed through two periods in the forest history of the United States and are entering upon the third. During the land-clearing and timber-mining periods, while forest products played such a spectacular and at the same time essential part in the industrial growth of the country, not only were tremendous quantities of high grade material destroyed but the highest grades were often put to the most commonplace uses.

During the crop-producing period upon which we are now entering, and

which will extend indefinitely into the future, our forests must first get complete and absolute protection from fire and so far as possible from insect and fungous diseases, and then gradually must come the growing of necessary and desired products on the most accessible and economically handled forest areas. Less accessible areas, once the old timber has been removed, if that is feasible, must be protected and serve for recreation and aesthetic purposes, or game and wild life sanctuaries, but silvicultural methods of handling will be economically impossible for a long time to come.

Trained men will be required to take the lead in handling our private forests. The type of man who goes into private work and the position he fills in any specific organization is of prime importance, first to the industry and the forests, but also to the profession and to himself.

Not a few private foresters are apparently in doubt as to just what their status is, and many seem to be in one of two positions: either they are spending most of their time and energy in the office preparing maps and working up reports, making general recommendations and attending meetings and conventions; or they are working in the capacity of woods foremen, general surveyors and timber cruisers.

A certain amount of office work is always necessary and practical experience in the various lines of actual woods work is highly essential, but I seriously question whether men trained for the profession of forestry can much advance the actual practice of silviculture, or even largely aid in the more systematic

and economical handling of privately owned timberlands, by continuously acting in either of these positions.

The office type of man, unless he has a sufficient trained force working with him to require most of his time in an advisory and consulting capacity, is too much out of touch with the woods work and the economic problems involved to be able to put in force or recommend to the management improved operating methods and wise silvicultural treatment for the various areas and types owned. He finds it difficult to back up the recommendations he makes with such figures on cost and returns, as will convince operators and stockholders of their value and feasibility.

On the other hand, the forester acting solely and permanently as woods foreman, or scaler, cruiser and surveyor is in too narrow a field. His time and energy are taken up with his particular job and he is pretty much out of touch with the management and with other professional men and their work. Some time spent in the various lines of woods work is highly important and gives a man a much needed viewpoint, as well as teaching him how to be of the most service to the men in the woods and to appreciate the value of their judgment in many practical matters.

To the writer it seems that the first and most important thing a forester should attempt when entering private employ is to gain the respect and complete confidence of his superior officers. Failing in this, he should expend his energies elsewhere. Without such respect and confidence he can hardly hope to accomplish anything worth while in his profession.



In any large or fair sized lumber or pulp and paper organization, getting its supply of wood or logs from soil-owned lands, the first work of the forester should be a systematic study of the business as a whole and this will require no little time. He should have no hesitancy about laying his cards on the table and making it clear to the management that he is ready and willing to devote his time and energy to furthering their interests. A large part of his usefulness will be in presenting facts and he must first know the requirements of the mill or mills and the general policy which is being and will be carried out.

The young forester must keep in mind the fact that his organization expects to make money. As Russell H. Conwell has said, "No man has a right to go into business and not make money. It is a crime to go into business and lose money, because it is a curse to the rest of the community. No man has a moral right to transact business unless he makes something out of it. He has no right to transact business unless the man he deals with has an opportunity also to make something. Unless he lives and lets live, he is not an honest man in business. There are no exceptions to this great rule."

In order to thoroughly understand the requirements of the mills and the general policy of the owners, the forester will need free access to all sources of information, both those relating to woods operations proper and everything at the plant pertinent thereto. Usually he should work in close cooperation with the engineers at the plant in making tests and in obtaining much general and specific information.

The next logical step is to get an accurate inventory of raw material. The management must be shown in a way that cannot be misunderstood, just what they have and for how long a time it will supply their needs. Experience has shown that a mere timber cruise, no matter how accurate, that shows only the total present merchantable stand, is but a small part of the essential information for the economical handling of timberlands. Some stands are old, some are young; some are in good growing condition, some not so good; some species are long-lived, some shorter-lived; some areas are smooth and easily logged, some are rough and expensive to handle. In most cases considerable areas are practically or entirely worthless. All these areas and types should be accurately mapped showing both timber and topography in such a way and to such a scale that the entire situation can be readily grasped by all the officials interested, as well as by engineers and the woods superintendent and foremen.

By the time this work is completed the forester should be sufficiently familiar with the entire holdings to definitely and efficiently divide the lands into logging and (or) pulpwood cutting units, and, working in conjunction with the woods superintendent and foremen, locate camp sites, main haul roads and tote or supply roads, so that provisions and logs and wood can be handled at the lowest cost and the men will lose a minimum amount of time in getting to and from work.

The boundaries of each logging unit should preferably be marked on the ground and the foreman given a print showing the area he is to cut, with loca-

tion of camp and main roads as well as the amount and location of logs or wood of each species. Such a print will save any intelligent man much time in laying out and looking after the work on various parts of his job. After a little time foremen greatly appreciate work and maps of this kind.

Once a complete grasp is obtained of the entire holdings, improved methods of fire prevention and control can readily be worked out and fire fighting tools and pumps placed at strategic points. Nothing worth while along the lines of silviculture or scientific management can be undertaken until the forest is reasonably safe from destruction or severe damage by fire.

If the policy of the owners is one of permanent or long time operation, or if the forester feels sure from the information now at hand that the property will meet, or can be made to meet the requirements, he is in a position to undertake systematic studies on the various groups and types and determine what ought to be done in each case.

No broad recommendations should be made looking toward changes in operating methods, until the forester is sure that good silviculture and absolutely sound economics warrant such a move. All changes should, if possible, result in improving the condition of the forest and lowering the cost or improving the quality of the product. Forestry must be an aid in solving the problems of the industry as well as a means for continuous and profitable use of the forest by present and later generations.

More and more in some regions in this country, as well as in Europe, it is coming to be realized that the value of

a particular forest unit lies in its economic location and in its capacity to produce desired products, rather than simply in its present merchantable volume. Just as a farmer purchasing a farm in the summer might find it profitable to harvest a crop of corn planted by the previous owner on a rocky hillside but can not make it pay to fertilize the soil and grow another crop; so, on most forest holdings, there are areas where operating costs are high and growth is slow, or where the species are not very valuable, or on which the crop of mature trees may be worth harvesting but where silvicultural methods cannot profitably be employed in growing another crop.

Studies by the forester must show up all such areas with their location and extent. Most important of all is the showing of areas best suited to the growth of the necessary products for the mills. Such areas will best repay the time and money spent on them in aiding nature. Usually, it is upon such areas that dependence must largely be placed for future supplies.

Several species often grow on the same areas. Some of these are long lived, some are short lived; some grow rapidly, some more slowly; some are quite valuable, while others are weed trees; and all of them are competing both in roots and crowns. The forester should lay out sample areas or plots for study, and, by numbering all trees of much size and taking counts on reproduction, he can, through annual or periodic re-measurements, build up the story of his particular forest.

Much valuable information may be obtained by inspection of the areas cut

each season and too much duplication of work prevented through coöperation with other operators and experiment stations.

Through study of costs and local conditions, he should come to know at about what age for each species being used, the growth is most rapid and when it begins to slow up. The most profitable sizes to handle must be studied, taking into account both wood and transportation costs, and final cost and values at the mill.

Large weed trees can in many cases be eliminated by girdling, and rapidly growing and short lived species on the most accessible and economically handled areas, can be cut on a short cutting cycle. All this work must be controlled by marking the trees to be cut.

Definite small jobs or areas may well be laid out and several methods of cutting tried out to determine relative costs to give an opportunity for the study of results over a period of years.

Generally speaking, it is true the world over that improved methods of operating and better tools and machines for woods work have not kept pace with the advancement in manufacturing. Tremendous strides have been made in the use of labor saving devices and high speed machinery at the mills, while comparatively little attention has been paid to such matters in the forest. The difficulty of applying power machinery except for very large timber as on our own Pacific coast, accounts for some of this, but there is a crying need for some means of materially lowering operating

costs, and the private forester may well strive earnestly to aid in bringing about this advancement.

To many, all this may seem like a slow process but lumbering in the United States and Canada is on a tremendous scale and each individual property is a problem in itself. These problems must, I believe, be solved largely from the inside, not from the exterior. The outside man usually does not and cannot well have a wholly correct viewpoint. At the same time, the man on the inside must keep in constant touch with others in similar positions and with the profession in general.

Private forestry is preëminently a work of coöperation. There must be full understanding and complete coöperation with owners and officials; coöperation with the woods organization in all details of the actual work; coöperation with other private foresters and the profession in general and coöperation with nature in aiding her to produce her best without transgressing her laws.

All this takes years of time, thought and hard work, but to the man who begins to see things working out as he desires, there is no little satisfaction in feeling that, in spite of all the work yet to be done and the endless problems to be solved, something a little worth while is being accomplished to aid in bringing to fruition three worthy purposes or aims: carrying out the policies of the owners; encouraging others in similar work; and striving for the perpetuation and improvement of the forests through putting them to their highest use.



# DETAILED SETTING PLANNING

## IN TIMBER SALES OPERATIONS ON THE SIERRA NATIONAL FOREST

By BERT HURT AND WILLIAM V. JONES

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Logging and silviculture must go hand in hand if perpetual forest production is to be achieved. The logger must exercise more control over the movement of logs from the stump through reserve timber and reproduction, while the forester must understand logging and the factors influencing costs. The authors, experienced in supervising cutting on government lands, describe their method of planning settings to obtain protection of reproduction without undue log costs. They show how planning of settings is primarily a problem in good forest management.

LOGGING plans, usually of very broad scope, have been in use for many years. An operator determines, according to the capacity of his plant, the volume which can be cut annually. He converts this volume to area and determines the number of years of his operation. This knowledge is applied in the division of the total area for successive annual cuts. Some sort of plan is then made defining the specific divisions to be cut annually.

### DESCRIPTION OF LOGGING PLANS

1. Plans for duration of operation: In the primary plan, several very important factors must be considered, such as utilization of available equipment and balancing of cut by species to compensate for any peculiarities in the marketing problem. Progressive development, in the sense of "tying in" successive annual cutting areas, thereby utilizing past development such as railroad grades, hoists, chutes, and other improvements, is of vital importance and should form the basis of any primary operating plan.

2. The secondary plan: This plan is prepared with the object of distributing the individual settings to provide the

most effective arrangement and sequence of annual cutting areas. Areas are carefully measured with reference to logging spurs and outlined as individual settings. This is effected in some cases by painting or marking the boundaries which have been determined by measurements, topographical features and occasionally by stands of reproduction.

Donkey engines can log effectively a distance of from 1200 feet to 1800 feet and tractors up to 3000 feet, depending on topography. These distances are considered in the planning and settings are made to conform with them. Sky-lines and swing roads are employed to handle settings which over-reach the maximum distances.

Bottoms of canyons, in donkey logging, and tops of ridges, on tractor sites, are usually defined as setting boundaries. To avoid damage resulting from pulling logs through young growth, boundaries are often fixed at the edge of heavy stands of reproduction.

Careful estimates of the volume of timber to be removed from each setting and the time required for removal are made and a definite annual program set up for each yarding unit. If the plan

is correctly prepared, the organization functions smoothly, no high or low points of production appear and normal conditions characterize the operation.

The foregoing plans have been developed and have found a practical use in logging operations.

#### DETAILED SETTING PLANS

Government timber sale contracts with private operators stipulate that a specific percentage of volume be reserved for seeding purposes and increment selected among thrifty and thrifty-mature trees with an understory of advance reproduction.

The necessity of protecting and preserving advance reproduction is paramount in the National Forests in the California region, especially in the sugar pine-fir type, since natural regeneration after logging is not dependable. Consequently any avoidable damage to advance reproduction should be prevented.

3. Detailed setting plans: In recent years, therefore, a third type of plan has been devised and is now called the Detailed Setting Plan. Its purpose is to eliminate, in all phases of cutting and yarding activities, the avoidable damage to growing stock.

In 1928 and 1929 the authors introduced this system of detailed setting planning on two major timber sale projects on the Sierra National Forest. The advantages of this system were demonstrated and resulted in immediate and general adoption of the system by each operator.

In order to properly carry out detailed setting planning, two men, one the timber sales officer and the other a representative of the operator, should function jointly. The excellent feature

of this set-up is that the operator has a voice in the planning. Formerly the burden of supervision rested solely on the forest officer.

At this point, it is well to mention the ultimate or ideal organization for setting planning. Assuming that operators will adopt detailed setting planning because of its evident advantages to them, we are confident that they will take on increasing responsibility until they have assumed the entire burden of planning, leaving the sales officer the responsibility of approving and supervising the method of executing the plan. Since the operator has a responsibility of avoiding loss of profit in logging, he can afford to employ for this work an experienced and well qualified logger who is of at least camp foreman capability. It goes without saying that the forest officer should possess an equivalent fund of logging knowledge or experience, if the balance between production and preservation is to be kept intact.

For the average donkey setting in the region referred to, from one to three days are necessary to complete the plan. The location of the spar tree is determined and before felling begins, main logging roads are laid out, usually in openings or in natural depressions. Secondary leads to these main roads are decided upon and marked. A system of main roads and laterals is developed to the extreme outer boundaries of the setting. Units of timber, comprising small groups, are defined and the most feasible method of leading them into the main roads decided upon. If necessary, special secondary leads are provided for individual trees. Secondary leads are set up near stands of reproduction to swing incoming logs around them. The





plan is developed in such detail that felling of individual trees must be considered and made a part of the plan.

Since both operators on the major project sales on the Sierra National Forest use the high-lead system, secondary leads are very important. Secondary leads in the first zone (100 to 500 feet) are of necessity tall "siwash" trees, or bull blocks, since the lift of the line near the spar tree is too strong for other types of secondary leads. Outside this zone, high stumps are used to control the angle of lead. A third zone, near the boundary of the setting, can usually be handled by low stumps unless the line crosses a depression.

At bull-block sites, high stumps should be left to guide logs into the main road as soon as possible after turning, *i. e.*, after the route of the logs changes direction. This prevents loss of reproduction at bull blocks. Siwash trees serve to keep the yarding line taut and at an angle which prevents side sway. Logs will sometimes leave the road and angle out through reproduction if continuous line control is not maintained. High speed donkeys do considerable damage if the main line or incoming log is out of control for even a few seconds. Shear logs are placed at angles in the main roads and near objects which may cause hang-ups of incoming logs. Plans are developed to such a point that after logs are pulled into the main roads, maximum line speed may be employed.

The majority of high stumps occur in the second zone, which ranges from 500 feet to 800 feet from the spar tree. This distance is too far for practical yarding by the clean-up crew, consequently if siwash trees rather than high stumps are

used in this zone, the regular yarding crew must do the pick-up work, which increases considerably the cost of logging. Using high stumps in this zone is therefore a decided advantage to the operator. An average setting will need about ten high stumps, which usually should be from three to four feet in height. Occasional siwash trees are used in the second zone in exceptional cases, such as controlling the line across a depression where a stump would not be of sufficient height.

The accompanying sketch shows in detail the layout of a setting logged during 1929. The slope parallels the logging railroad, and a draw and a ridge cut across the setting at right angles to the line of lead. This particular type of setting must be very carefully planned, since it involves considerable side-hill yarding. Roads must be planned so that there is no likelihood of logs rolling out while being yarded at high speeds. A cut of 41,000 board feet per acre was made on this setting. Such a cut in tall timber involves a wealth of planning detail to insure a minimum damage figure for felling and yarding. In addition to minimizing damage to growing stock, the plan must be conducive to high logging production.

One operator shows by the following table the increase in production resulting from detailed planning of settings in Government timber during 1929 as compared to unplanned settings in Government timber in 1928.

Yarding Unit	Daily Average	Yarding Unit	Daily Average
	1928		1929
	Board feet, log scale		Board feet, log scale
#4	31,030	#4	60,140
#6	39,650	#5	75,330
#7	49,800	#6	47,000
#8	45,270	#7	63,330
#10	39,940	#8	57,100

A comparison of yarding cost gives for 1929 a cost per 1000 board feet of \$1.76, for 1928 a cost of \$1.81 per thousand, a reduction of 3%, which can be directly attributed to detailed setting plans, since for both seasons logging conditions were nearly identical.

The footage contained in high stumps is not scaled and charged to the operator. Its value represents the investment by the Government in the detailed plan for the setting. Following is a comparison of investment in high stumps and the resultant saving of growing stock on each setting.

Setting	Sale value of footage contained in high stumps	Sale value of growing stock saved
1	\$1.45	\$22.66
2	2.03	44.00
3	4.12	34.98

In estimating the reserve stand saved, only timber which would have been destroyed, except for high stumps, is considered.

The object of detailed setting planning is to obtain the maximum production at the minimum cost and with the least possible damage to trees that are to be left standing. As shown by this study of the planning, production is increased by from 15 to 25%, yarding costs are lowered 3% and a saving in reproduction and seed trees is effected at a ratio of from 10 to 20 times the investment in detailed setting planning. Perhaps the greatest benefit to timber sales logging practice is the assumption by the operator of responsibility in preparing and administering the plan.

# FOREST SOIL RESEARCH IN RELATION TO FORESTRY <sup>1</sup>

## WITH PARTICULAR REFERENCE TO THE NORTHEAST

By L. G. ROMELL

*Charles Lathrop Pack Professor in Forest Soils, Cornell University*

Forest soils are developed under natural equilibria; agricultural soils are artificial. Forestry operations must disturb natural soil conditions as little as possible. The author, an internationally known forest soil expert, gives reasons and outlines also the course research and empirical investigation should take to put American forest soil science on its feet.

THE CLOSE relation between forest soil research and forestry practice, even the economic conditions governing it, becomes evident if one stops to realize what characterizes the forest soil as contrasted to agricultural soils. There are several fundamental differences between the two. But they can all be expressed in one general formula by stating that the forest soil is a natural or slightly modified natural product whereas the agricultural soil is an artificial product. The forest soils more or less closely represent natural equilibria. The agricultural soils are distinctly changed from their natural state and are maintained in their normal condition only by constantly recurring artificial measures, be it a thorough working with plow and harrow or merely fertilizing. Just as soon as these artificial influences stop working, *i. e.*, when the soil is abandoned, the agricultural soils begin to "degenerate", to change back to some "wilder" condition. Evidently, this fundamental difference between forest soils and agricultural soils is due to the intrinsic differences between forestry and agricultural practices. In agriculture, it is necessary to

maintain a distinctly artificial soil condition, because the crops raised consist of exotic or domesticated plants which do not naturally belong to the particular soil, and on the other hand it is possible to maintain the required artificial soil condition, because the returns from the agricultural crops are sufficiently large and rapid to pay for the costs involved. Forestry, on the contrary, depends on species belonging to the natural vegetation of the soil, or at least adapted to natural soils in other, climatically similar regions. And forestry is bound to do so, for economic reasons, because up to the present day the financial returns from forestry have been too low, or too slow, to warrant any but the very cheapest, and mainly indirect, soil improvement measures. This also holds true for countries with the most intensive silviculture. It is true that, in order to secure reproduction, liming and some simple forms of working the soil, mostly in strips or patches, have been practiced to a certain extent, but this has been and is, after all, a mere exception to the rule. Even when practiced it generally affects only a small part of the area and a fraction of the rotation. Moreover,

<sup>1</sup> Presented before the New York Section of the Society of American Foresters, January 31, 1930, at Albany, N. Y.



the actual tendency, even in countries with intensive silviculture, is not towards, but against the transformation of silviculture into a kind of gardening. Everything indicates that in the future forestry will have to rely still more than now upon natural equilibria.<sup>2</sup>

Incidentally, even in agricultural soil science, the importance of the natural biological and chemical processes in the soil has been increasingly recognized. Some earlier agricultural chemists regarded an agricultural soil as much like the quartz sand in a culture pot, an indifferent carrier of moisture and applied nutrients. This view has been radically changed, and for good reason. In spite of the relatively great power of agricultural practice to change the soil conditions at will, there are still peach soils, grape soils, alfalfa soils, and so forth, depending on primary variations and resulting differences in local climate, water retaining and absorptive power, etc., and also more or less in microbiological activities.

If the primary soil differences and the complex life of the soil are basic to agricultural soils, where human activity is continually busy in supplementing nature, it is easy to understand that they must be all-important in the ecology of a self-contained forest community.

If the forest soil should be worked and mixed, it is not by the farmer's plow and harrow but by the digging around of earthworms, insects and other

tiny creatures. If it should be fertilized, it is by the action of soil organisms decomposing the debris which comes to the ground from the trees and other higher vegetation. In particular, the forest trees are altogether dependent on the life of the soil for their nitrogen supply, their only other source of combined nitrogen being the small amounts which come down with the rain water.

Probably few people realize how effectively, in the better forest soils, the invisible soil population takes the place of the farmer, both in working and fertilizing the soil. Burger (2), in Switzerland, determined comparative porosity data for different forest and agricultural soils. He got the remarkable result that the better forest soils were superior to even a freshly worked agricultural soil, both in air capacity and in permeability. When some time had elapsed after the last working, the comparison was of course still much more unfavorable for the agricultural soil, because the latter is in an unstable condition. Burger with good reason compares the agricultural soil to an unorganized mass of building material, whereas the natural forest soil, with its definite, stable organization, is like a house built from this same material. Also the nitrogen supply is excellent in the best forest soils; in fact, the concentration of nitrates may run just as high or higher than in a rich, heavily manured garden soil.

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<sup>2</sup> Prof. S. Heiberg kindly drew my attention to the essential content of the preceding paragraph having been set forth very well by P. E. Müller in 1878 (5) in saying: "One will realize what fundamental difference there is between the theoretical foundations of agriculture and of forestry because in agriculture working of the soil is regarded as a given thing, while in silviculture no direct soil working is undertaken. The conditions on which fertility depend in agriculture are not the only ones in forest production; they are here combined with another, perhaps still more powerful influence. No wonder that the theoretical foundations of agriculture have not satisfied those who have tried to transfer them directly to forest production."

On the other hand, there are forest soils which are the poorest among the poor, with no nitrification at all, and even a poor formation of ammonia nitrogen, and having a compact, very unfavorable structure. Such is the case where the life of the soil, for some reason or other, is deficient or of an unfavorable type.

Two conclusions stand out from what has just been said. First, the fundamental importance of that immensely complicated interaction of processes which may shortly be termed the life of the soil. Second, the great diversity of nutrient conditions in forest soils, which probably even in New York State cover a much wider range than do all the agricultural soils of the United States taken together.<sup>3</sup>

Of course, these variations in the forest soils do not occur haphazardly. On the contrary, the different conditions are to be looked upon largely as natural equilibria, eventually more or less modified by human influences. Now what determines these natural equilibria, and how and to what extent can they be influenced by measures within the reach of silviculture? This, evidently, is the central problem of forest soil research, and the very point in which foresters are interested.

One could think of different ways of organizing the attack on this big problem. One way would be to put in every effort on fundamental research, trying to analyze as fully as possible the whole mass of interwoven microbiological and other processes involved in the natural equilibrium, in the hope of

arriving in time at a synthesis which would enable us to explain the natural variations and to foretell the results of every possible change of conditions. Such a synthesis is, of course, the ultimate goal of research. But it will take very long to get that far. It will even, in all probability, take very long before any really new advice can be safely given as to silvicultural practice from this angle. The largely unknown microcosm of the soil is so complex that conclusions drawn from an isolated study of one or a few selected organisms or processes must be applied with the greatest caution. A certain organism, for instance, may behave quite differently in the soil than in our cultures, as is well demonstrated by the seemingly different requirements of the nitrifying bacteria when isolated in flasks in the laboratory and when living free in the soil. It is more and more generally recognized that a natural soil, like a living organism, must be studied as a whole to get a correct idea of its responses. This means that for a long time to come more or less empirical methods of attack will probably continue to be more important than even successful efforts to isolate the organisms or processes.

This situation assigns a special importance to type studies of different kinds. Typological or taxonomical studies are from the very nature of things the logical starting points and necessary tools for further progress in any science dealing with complex products of nature, be it rocks, animals, plants, plant communities, or soils. Every experimental work

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<sup>3</sup> Partly due of course to the fact that the agricultural soils represent a selection, even to start with, intensified, as time goes on, by the poorer lands being abandoned and dropping out.

or simple determination or measurement must refer to a definite natural unit or type, if it is to be of any real value. This is recognized today even for the agricultural soils, and is, if possible, more true for forest soils.

For the study of forest soils, one single system of types, such as the soil mapping types used in this country, is not sufficient. At least as important as studies along this line are probably the recognition and differentiation of natural types of forest humus. The humus cover without any doubt represents the central and most promising object of forest soil research. As pointed out before, the humus cover is practically the only source of available nitrogen for the forest trees. Experience has also shown the silvical properties of a forest soil to parallel closely the type of humus cover and the rapidity and type of nitrogen transformation in it. At the same time, the humus cover is the part of the forest soil which is the most directly influenced by the vegetation. It is also the most reactive part of the soil, it is the part which responds most rapidly to a change of conditions. Practically the only way of influencing soil productivity by silvicultural means is through the humus cover.

To be sure, the characteristics of the humus cover are correlated to the general soil type, but probably the correlation is not a perfect one even under strictly virgin conditions. And, when silvicultural treatment affects it, the humus cover is liable to change independently of or at least far ahead of the general soil type. Therefore, it is necessary to have an independent system of humus types.

But forest soil research is not con-

cerned alone with the soil, including the humus cover. In its relation to forestry, in fact, forest soil science is forest ecology or forest biology. The silviculturally important relations between soil and stand involve not only the influence of soil characteristics on tree growth, but just as much the influence of the—natural or silviculturally modified—forest association on the soil. This brings the study of natural units of forest vegetation into the realm of forest soil research also.

Just as the humus and general soil types are correlated to each other, particularly under strictly virgin conditions, so are they to forest types. But no more in this case than in the former is the correlation perfect, and an independent system of forest types is needed.

The establishment of good natural types of these different categories is not merely a first preparatory step necessary for further research in forest soils. Such types represent in themselves a positive contribution of direct and immediate value to forestry. They help the forester just as they do the soil scientist in correlating and matching different observations and results. That this is so has been proven by practical experience. P. E. Müller's humus types form a backbone for Danish forestry as well as for the majority of modern forest soil studies, at least in the Scandinavian countries. The use of the floristic forest types as established especially by Russian authors and by Cajander in Finland is rapidly spreading to different countries and has demonstrated the value of such types for various purposes.

The distinguishing of natural humus types is believed to be perhaps the most important immediate problem for forest



soil research in this country. There is even in New York State the same wide range of variation as for instance in Scandinavia from a true earthworm mull to a heavy raw humus, but hardly any of the different elements of the series are exactly like the European ones, and rather characteristic intermediate forms more or less approaching a mull seem to play a much greater rôle here. It seems to be absolutely necessary for further progress to elaborate a good scheme of classification of these humus forms. It is hoped that this can be done by further developing P. E. Müller's classical scheme, as Hasselman (3) has done for the Swedish raw-humus and related humus forms. To do this in the right way is a difficult task, as are all problems of natural classification, requiring both a certain tact and a great amount of careful observation. It can not be definitely accomplished in a hurry. It is strongly felt, however, that the time and thought put in on this project will be well spent.

This is probably particularly true for the Northeast, for the following reason. No doubt Müller's humus types have been of greater importance in Denmark than anywhere else. This is certainly not due to chance. One might be inclined to explain it by the fact that Müller was a Dane and by his humus types being particularly adapted to Danish conditions. That is hardly the true explanation, however. The reason is rather that Denmark lies in a tension belt between the zone of brown soil with mull and the zone of true podsoles with more or less pronounced raw humus. It is reasonable to assume that in such a region silviculture can do more to improve—or to deteriorate—

the soil than right in the heart of a climatic soil zone. New York State, or large parts of it, is just like Denmark in comprising a transition or tension belt between a zone corresponding to the brown soil region of Europe and a zone with true podsoles and raw humus. It can therefore be reasonably expected that good silviculture and a good classification of humus types will be more important here than either in Canada or further south or west from here.

Hardly less urgent seems the question of forest types. It is true that there are already forest types established in the region and in current use. The present American forest types, however, are mere cover types or broad topographic types. They are no doubt excellent for the purposes for which they are intended, for rough economic surveying, for example, but they are hardly sufficiently homogenous natural types for scientific use in connection with detailed soil studies. The establishment of floristically characterized, ecological forest types seems therefore to be strongly needed. Thus far, only a very cursory attempt has been made in the United States in this direction, by the Finlander Ilvessalo, one of Cajander's pupils (4). In Canada, however, work is in progress in several places. The interest in Cajander's types seems to be growing also in this country, and perhaps the matter will be taken up soon enough by competent foresters and ecologists. The need being pressing, however, from the standpoint of forest ecology, it is felt to be perfectly justified in the present situation to include a study of floristic forest types as one of the first points in a program of forest soil research.

No doubt, such forest types will be of

importance to forestry in other respects than in connection with forest soil research problems. This will certainly be true even for New York State. It might possibly be expected, on the other hand, that forest types will be of somewhat less importance as site indicators in this transition zone than they probably are up in northern Canada—just as they seem to be less fixed in Denmark than in Finland. In New York as in Denmark it will no doubt be particularly important to make a distinction between “fundamental” types and “conditional” types (1), the former being determined by the site, the latter mainly by the silvical treatment.

A particular problem of New York State, where the forest type studies might eventually furnish some direct help to silviculture, is the reforestation of the 4 million acres of abandoned farm land. Wherever the original forest type can be reconstructed in one way or another, the type studies might give some valuable hints as to what to plant on the land.

Let it be stated once more, as a summary, why type studies stand in the foreground among the problems to be tackled by the young forest soil research in this country: Without a good, more or less natural classification, all the material collected would be a mixture of doubtful value. It must be remembered that every sample taken for analysis represents primarily itself and nothing else, just as a thermometer strictly speaking shows its own temperature, and nothing else. The analyses carried out on the sample have a more general interest only insofar as the sample can be taken to represent some definite natural unit. But that is not all the merit of type

studies. Even if research had advanced so far that it would be possible on every little spot from a series of microbiological, chemical and other analyses exactly to foretell what would happen to the soil as a consequence of different measures, it would not be practical to send an army of microbiologists and chemists to every forest stand in order to tell the forester what to do (provided he would consent to do it, which is also a question). For the practical application of laboratory knowledge it must be tied up with some easily recognized characteristics of different natural conditions, so that foresters can use the information in the field, without carrying a laboratory along. For this reason, such things as good natural types of forest, of humus and of soil will probably never become obsolete. Even if, in some remote age, pure research should be able to do without them, they would retain their value as the point of contact between research and practical application. This is one further reason why, at this occasion, type studies have been particularly stressed.

Another point of view which I would like to stress is the necessity of a large amount of empirical silvical experience, especially at a stage of development when we know so extremely little about the microcosm of the soil as we do today. The motive underlying in this country the present considerable interest in forest soil research may be a hope to arrive at some clever short-cut to the most profitable silviculture, without the necessity of putting in scores of years collecting empirical data from actual silvicultural operations. It might seem from a hasty look into European literature that this hope is warranted. I think

that such a view is essentially wrong. Nowhere, not even in P. E. Müller's country, is European silviculture built upon research; rather has successful research always built upon accumulated practical experience. The keen and interested foresters in the silviculturally prominent countries are the men who really have laid the foundations. The help which research has yielded to foresters has mainly been to explain and correlate facts which would otherwise have been isolated or not understood, to direct the ideas and formulate useful working hypotheses.<sup>4</sup> Will it be possible, in this country, to reverse the order and create a good American silviculture with very little silvicultural experience? Frankly, I doubt it. Forest ecology has not yet been able to formulate any laws permitting very general and at the same time specific application. Perhaps the majority of the questions of real silvicultural importance have to be tried out by local experience. The outcome might be radically different in various regions. Just one striking illustration: In the Black Forest in southwest Germany, the foresters are much afraid of opening the stand, because then a luxuriant vegetation of blueberries is likely to come in and a raw humus formation may begin. In northern Sweden, a recognized universal remedy for a bad raw humus is to make a clear cut. Then the blueberries die out more or less completely and the raw humus "ripens," or starts to decompose.

If reliable practices of silviculture are to be ready for use say forty years from now, when the western forests are gone and the moment has arrived for silviculture to take its place seriously in this country, I think it is time for all of us to get started. Foresters should give different silvicultural methods fair tests on different lands and in different forest types, and the research men should first of all study types, so as to be able to interpret the forester's results correctly. Working hand in hand, we might be ready in time.

#### REFERENCES

1. Bornebusch, C. H. Skovbundsstudier (Dissertations on flora and soil of Danish woodlands).—Det forstlige Forsøgsvaesen i Danmark 8, p. 1-288. Danish with English summary. 1923-1925.
2. Burger, H. Physikalische Eigenschaften der Wald- und Freilandböden (Physical properties of forest and field soils).—Mitt. d. Schweizerischen Centralanstalt f. d. forstliche Versuchswesen 13:1-221. 1922.
3. Hesselman, H. Studier över barrskogens humustäcke, dess egenskaper och beroende av skogsvården (Studien über die Humusdecke des Nadelwaldes, ihre Eigenschaften und deren Abhängigkeit vom Waldbau).—Medelanden från Statens Skogsförsöksanstalt (Reports of the Swedish Institute of Experimental

<sup>4</sup> Cf. Zon's review in 1927 of some achievements of European forest soil research (8). All the examples he mentions are of the nature just indicated. Research is no witchcraft, but its rôle in relation to forestry is not therefore of minor importance. Without help from the scientific side, if for no more than to formulate sound working hypotheses, the field easily grows wild with wild theories, which might be bigger factors in hampering progress than ordinarily realized. "Some hypotheses are dangerous," H. Poincaré says (6, p. 151)—"first and foremost are those which are tacit and unconscious."



- Forestry) 22:169-552. Swedish with German summary. 1925.
4. Ilvessalo, Y. Notes on some forest (site) types in North America.—*Acta forestalia fennica* 34, No. 39. 1929.
  5. Müller, P. E. Nogle Undersøgelser af Skovjord (Some investigations on forest soil).—*Tidsskrift for Landøkonomi* (Copenhagen). Danish. 1878.
  6. Poincaré, H. *Science and hypothesis*. London & Newcastle-on-Tyne. 1905.
  7. Romell, L. G. Review in *Journal of Forestry* 28 (4):552-557. 1930.
  8. Zon, R. Silviculture as a factor in maintaining the fertility of forest soils.—*Proc. and Papers of the 1st Intern. Congr. of Soil Science*, Vol. 4, pp. 575-582. 1928.

"One cannot become familiar with the Forest Service . . . without being deeply impressed with not only the excellent informational organization and the precision with which the organization works, but also what in war time we came to call morale. Those who have risen to important positions in Forestry impress one by virtue of their character as well as their training. They exhibit integrity of the highest order in their relationship to their responsibilities. It is an indication of what should exist in all government work but which lamentably does not."

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## II. MYCORHIZA STUDIES

### THE DURATION OF CERTAIN PINE MYCORHIZAE<sup>1</sup>

By ARTHUR PIERSON KELLEY

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As knowledge of the importance of mycorrhizae in the physiology of nutrition becomes more perfect, the forester should be less content with the mere knowledge that a tree has roots. In this, his second paper, the author discusses conditions favorable and unfavorable to the development of mycorrhizae.

ALMOST all writers of books on forestry, in describing the mechanism by which materials enter the tree, content themselves with a brief account of root-endings and their reputed production of root hairs. A few writers, it is true,<sup>2</sup> have realized that root hairs are exceptional in most sorts of forest trees and that in the majority of cases the root-endings are mycorrhizae.

This paper records some observations on the occurrence and duration of mycorrhizae in several species of pine.

Development of tree roots may take place at any season when conditions are favorable. In the last century it was debated whether root growth takes place in winter and one writer, Theodor Hartig (3), decided that continued production of wood cells in roots is not a normal occurrence. Although root development seems confined to the temperate or growing season, it has been noted that not all trees produce roots at the same season or at the same rate. In some trees, as the European linden (according to Goebel's *Organography*), the greatest

development of roots is in autumn while in oaks it is in the spring. So, too, in a description of mycorrhizae it is probable that no statement can be made which will be of universal application.

During the last two decades of the 19th Century it came to be generally understood by investigators that roots formed by forest trees are almost always developed into structures composed of root and symbiotic fungus,—mycorrhizae. Frank, who was active in investigation of mycorrhizae, considered that mycorrhizal development depended on the presence of humus, and that mycorrhizae lived until humus of their locus was exhausted. He considered production of mycorrhizae to be analogous to production of root-hairs, and combated Hartig who had stated (4) that tree roots are not continually covered with a fungus mantle but only in autumn and winter. Hartig observed many newly formed root-tips in summer which were completely fungus-free (or so they appeared externally), but Frank rebutted that the root-tip is not concerned in ab-

<sup>1</sup> "Mycorrhizal Studies. I. Mycorrhiza of Mont Alto Stock," appeared in the January, 1930, *JOURNAL OF FORESTRY*, pp. 34. In the present contribution the author adopts "the older and more widely accepted spelling of the word."

<sup>2</sup> Dr. Gifford's (2) account is admirable, except that he speaks of truffles as being mycorrhizae; the truffle is usually considered to be a fruiting body of a fungus which lives frequently if not always in mycorrhizal relationship with tree roots.

sorption. "I have observed on countless occasions," stated Frank, "roots of plants which have been taken from forest soil as well as from pots (potted with forest soil) at all periods of spring and summer, and have watched root development in root boxes provided with glass walls. I have seen true mycorrhizae persistent, continually surrounded by their fungus mantle with which they resume growth; and it may be stated as a rule, that under ordinary natural conditions mycorrhizae never lose at any season their fungus investment." (1) Frank further concluded from study of beech and ironwood roots that mycorrhizae may live at least two years, and that apparently they can live much longer when provided with sufficient humus. Like other plant organs, mycorrhizae do not have an endless existence but finally die off.

McDougall (6) has considered mycorrhizae to be annual structures which are formed in summer and persist through winter. His conclusion was based on observation of many tree roots both from samples removed at intervals and from living portions covered with a glass plate and observed from time to time. Rayner (9), too, has found *Calluna* to have annual mycorrhizae.

Occurrence of annual mycorrhizae is not unanimously conceded, at least for all plants. Rives (10), in his study of mycorrhizae in relation to French viticulture, observed the period of formation and duration of mycorrhizae. Under ordinary conditions a great number of rootlets were developed in spring and died at the end of the vegetative season. During winter he found places at the ends of roots where numerous rootlets

had disappeared. (We might remark that mycorrhizae soon become brittle and are readily detached even though the rootlets are still living.) He noted, however, that rootlets formed late in the season persist through winter into spring and he regarded it as an exaggeration therefore to speak of the dying of all roots in autumn.

Peyronel (8) also found persistent mycorrhizae in certain plants in Italy. He studied internal structure of mycorrhizae and discovered swollen tips of hyphae, gorged with materials (structures called vesicles), present in October but in November, December and January the vesicles emptied their contents while the mycelium increased in vigor.

We would naturally suppose that duration of mycorrhizae is essentially the result of protoplasmic response to environmental stimuli, both external and internal. Evidence for this statement is afforded by Paulson (7) who noted that during drought of even short duration mycorrhizae are desiccated and thereby killed. "Mycorrhiza does not revive after being destroyed by lack of moisture and does not reappear on the return of copious rain until new rootlets have been formed and they in their turn have become associated with a fungus. Provided a drought is not sufficiently prolonged to destroy the thicker roots on which are the finer ramifications, new fibres are produced in abundance, on the return to normal atmospheric conditions, among the same leaves where mycorrhiza formerly existed and where fresh fungus mycelia have already appeared." (l. c., p. 214.)

It is evident that surrounding condi-



tions of moisture and temperature (the latter acting primarily upon the moisture supply) may affect duration of the mycorrhizae. Paulson further states (l. c., p. 217): "There are indications that in cases of severe drought when much mycorrhiza has been destroyed, certain trees, notably, birches of all sizes, and hornbeam stools, lose vitality and become specially subject to attacks from microfungi." . . . Hitier (5) quotes Mangin as remarking that black canker of chestnut tree roots kills the mycorrhizae and thus, by lessening the absorbing surface, kills the tree.

The writer has studied certain pine mycorrhizae from the Eastern States and Minnesota, and has collected material at all seasons of the year. Living mycorrhizae have been found at all times while some observations made upon living roots in glass boxes, observed under a Greenough binocular, would indicate that elongation of the root never ceases entirely but may continue in the winter, although slowed down to a few microns increment in a week.

An adequate water supply would seem to be the first essential—of soil climatic conditions—for development of mycorrhizae. Other conditions being favorable, there is rapid development of white mycorrhizal root-tips after rain. Even though these elongate rapidly and seem destitute of fungus investment, there are usually fungus hyphae to be found in the tissues. Eventually all or most of the root endings assume a rounded or coralloid appearance and become darker in color. It is possible that metabolic activity of the fungus causes production of substances which inhibit meristematic activity of the root,

and at the same time these or other substances cause a darkening of the hyphae with consequent darkening of the mycorrhizae. Pericyclic cork also forms and the mycorrhizae appear as dark, almost black, brittle structures. They appear to be dead and may even be shriveled. It is quite possible that structures such as these have been described as dead.

Under appropriate conditions, especially of favorable moisture and temperature, apparently dead mycorrhizae may recommence active development. If mycorrhizae are collected in winter during a "mild spell" or if wild seedlings are dug up and placed in a jar of water at room temperature, many of the blackened mycorrhizae may be seen to produce new white tips and these will develop into new mycorrhizal rootlets. Freezing of mycorrhizae followed by rapid thawing seems to destroy them for samples collected from surface soil after freezing appeared dead and failed to grow in culture while others removed from subsoil did grow. Freezing and rapid thawing of humus and soil humus, where most mycorrhizae are found, is exceptional in our temperature forests but occurs in sands. Failure of seedlings to survive in sands may be due in part to destruction of mycorrhizae by freezing.

At Gunpowder Falls, Maryland, the city government of Baltimore has had planted many seedling trees, — red, Scotch and white pine among others. Most of the trees are developing thriftily but some have remained stunted without apparent reason. Upon examination in February it was found that the stunted trees had been planted somewhat too shallowly, and the roots had formed

laterally just beneath (in these cases) bare soil. The laterals had grown for a considerable distance, being "attracted" particularly to the neighborhood of other pines where they branched freely into coral clusters. Many of the mycorrhizae were frozen and dead, and it was evident that they would be unable to withstand any sort of desiccation. It would seem that in summer such roots would be destroyed by excessive drying.

Water supply is further conditioned by soil composition. A supply of humus does not insure success of mycorrhizal development. It is well known that in moist forest, seeds germinate and seedlings grow by hundreds upon fallen logs or stumps and that saplings may exist for years without any contact with mineral soil. In this condition we are probably correct in believing that they are dependent upon fungi for rendering available the organic materials of the substratum, although they may absorb directly a very small portion of the simpler organic acids without intervention of other organisms unless that of saprophilic bacteria. The condition is dependent *inter alia* upon water, and similar seedlings growing upon humus material of rotting stumps, when exposed to full insolation of the habitat, have been found to dwindle. This action seems due to unfavorable water relation rather than to an unfavorable mycorrhizal development.

The whole relationship of fungus to root is so complex, so dependent upon interactions of various conditioning processes that we cannot speak very

dogmatically about it. We can state that under certain conditions mycorrhizae have behaved in a given way; and one of these behaviors under usual field conditions seems to be a continuous presence of living mycorrhizae, the absorbing organs of the pines, upon pine roots.

#### REFERENCES

1. Constantin, J. 1924. Les mycorrhizes et la pathologie végétale. *Rev. Bot. Appl.* 4:497-508.
2. Gifford, John. 1920. *Practical forestry* (abbr. title) xiv, 284 pp. New York.
3. Hartig, Th. 1863. Ueber die Zeit des Zuwachses der Baumwurzeln *Bot. Zeit.* 21:288-289.
4. ———. 1886. Ueber symbiotische Erscheinungen im Pflanzenleben. *Bot. Centralbl.* 25: 350-352.
5. Hitier, H. 1912. (The fate of the chestnut tree). *Rév. Hort. (Paris)* 84: 17-18. (*Exp. Sta. Rec.* 551).
6. McDougall, W. B. 1914. On the mycorrhizas of forest trees. *Amer. Journ. Bot.* 1:54-74.
7. Paulson, R. 1924. Tree mycorrhiza (Chiefly field notes). *Trans. British Mycol. Soc.* 9: 213-218.
8. Peyronel, B. 1923. Fructification de l'endophyte à arbuscules et à vésicules des mycorrhizes endotrophes. *Bull. Soc. Mycol. France* 39:119-126.
9. Rayner, M. C. 1926. Mycorrhiza. *New Phytol.* Reprint, No. 15.
10. Rives, L. 1923. Le court noué et les mycorrhizes endotrophes de la vigne. *Rev. Vitic.* 59:385-392; 405-409.

# THE EFFECT OF AFTER-RIPENING TREATMENT ON THE GERMINATION OF EASTERN HEMLOCK SEED

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Technique of handling seed rather than its quality is often responsible for low germination. The author gave his experimental seed an after-ripening treatment by stratification at low temperatures and found its germination per cent to have increased beyond that generally accepted for the species.

## INTRODUCTION

THE MARKEDLY beneficial effect of after-ripening, taking place during moist storage at low temperatures on many tree seeds, which was recently reported by Barton (1) (2), suggests that similar processes may be effective in hastening the germination of other fall-seeding species, not examined by her. Such has been found to be the case with red spruce (*Picea rubra*) and Balsam fir (*Abies balsamea*). In this paper experiments with eastern hemlock (*Tsuga canadensis*), will be reported.

## HISTORICAL

Eastern hemlock is known to be a slow germinator. It is one of the species, whose seed are apparently sound by direct inspection and cutting test, but which germinate poorly under ordinary testing conditions. Since this hemlock is known to be extremely sensitive to site conditions (5), failure to obtain good germination in testing the seed suggests a defect in the technique. Frothingham (3) states that from 30 to 60 per cent of the seed are fertile. The seed fall during late autumn and winter, germinate from March until the end of May. The best seed-bed is a moist, well-decomposed leaf litter in

which the seed become completely buried. Toumey (8) gives the average germination of commercial seed as 21 per cent. Toumey and Stevens (9) state that often from 50 to 60 per cent of the seeds are blind. Based on 16 samples, the highest germination was 43 per cent in 50 days and the average 22 per cent in 50 days. An average of 22 per cent sound seed were found remaining after 50 days in their tests, *i. e.*, one-half of the potential number of good seed germinated. Autumn sowing is recommended, not because of the benefit from after-ripening, but "because of the extremely poor keeping qualities of the seed". In their soil tests delayed germination was evidenced by more than two-thirds of the germination coming 45-55 days after sowing.

Rafn (6), in reporting tests made at the Danish Seed Control Station, gives the average germinative capacity at 18.2 per cent. He observed that the seed were very slow in germination. He states: "I am not yet clear if the seed is really slow in germination, or whether it is mostly of bad quality." His best result was 49 per cent in 100 days. Jacobsen (4) reports similar results. Her figures are based on but 5 samples, of which the highest was 60 per cent and the lowest 1 per cent in 15 weeks. She



mentions the presence of a large number of empty seed, to which in part she ascribes the poor germination.

As far as is known no direct experiments have been made on the effect of stratification at low temperatures on the germination of hemlock. Nurserymen have long practiced fall-sowing as a means of obtaining acceptable seedling stands, and this, in itself, is some proof of the effectiveness of after-ripening treatment.

#### EXPERIMENTAL

In January, 1930, a sample of hemlock seed was received from the Brown Company. It had been collected in the fall of 1929 in New Hampshire and was extracted at Berlin, N. H., in the first week of January. While a cutting test showed 94 per cent good seed, an average of but 2 per cent had germinated after 55 days in the Jacobsen apparatus at 24° C. Seventy per cent of the seed were still found to be good at the end of this period. Seeds of this sample were stratified as follows: they were placed in moist peat, enclosed in a wooden box, and buried in 1 foot of sand in the basement of the Marsh Botanical Garden greenhouse at Yale University. The temperature at this depth was approximately 10° C. After 30 days some were removed from the peat and set to germinate immediately. One series of 400 stratified seed and 400 untreated dry seed was set up in individual Jacobsen germinators, 200 seed 10 cm. and 200 seed 5 cm. above the water level in each case. The germinators were kept in a basement room of the Osborn Botanical Laboratory, Yale University, where the temperature varied from 15° C. at night to 25° C. during the day. Another series

of 200 stratified seed and 200 untreated controls was sown two weeks later in flats in the greenhouse. Seed were sown in drills in 4.5 inches of specially prepared soil, disinfected with formalin as described by Toumey and Stevens (loc. cit.). Soil thermograph records showed that the temperature of the upper layer of the soil fluctuated from 10-15° C. at night to 27-32° C. by day. Sprouts were counted and removed at 5-day intervals. Seed were considered germinated in the germinators when the hypocotyl protruded beyond the testa, in the soil when the seedling appeared above ground.

#### RESULTS AND DISCUSSION

The results are shown in the accompanying tables and curves. In every case stratified seed germinated more promptly and final germinations were almost double as high after the same time, as in the case of the controls. It is of interest that higher germination was secured with soil tests, even during 40 days than in the germinators. Usually soil tests give lower results than tests in germinators (9). It is possible that the temperature was more favorable in the soil tests. To be comparable, temperatures should have been the same. The seed in the soil tests was also subjected to two weeks longer stratification, which may explain the difference. It will also be noted that considerable difference was found between the two controls in germinators, the one at 5 cm. above the water surface, and the other at 10 cm. The one nearer the water, with a more abundant moisture supply, germinated best. In the after-ripened samples the differences were less marked. These observations suggest that hemlock seed may need more moisture for germina-

TABLE I.  
The Effect of After-Ripening Treatment on the Germination of Eastern Hemlock Seed.

Jacobsen Germinator.		PER CENT GERMINATED AFTER																
Number of seeds—100		DAYS																
Date Started 2/14/30																		
Water Level 10 cm.																		
Temperature C. 15-25°																		
Untreated control.	SAMPLE No.	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
	42	0	0	1	2	4	6	8	8	11	12	12	14	17	18	19	19	
	43	0	0	0	2	4	6	6	6	6	6	6	—discontinued					
	average	0	0	.5	2	4	6	7	7	8.5								
	44	0	4	21	35	38	42	43	45	45	45	45	45	45	45	45	45	45
Stratified 30 days @ 10 C.	45	0	9	22	35	40	42	45	45	45	45	45	45	45	45	45	45	45
	average	0	6.5	21.5	35	39	42	44	45	45	45	45	45	45	45	45	45	45
Jacobsen Germinator.																		
Number of seeds—100																		
Date Started 2/14/30																		
Water level 5 cm.																		
Temperature C. 15-25°																		
Untreated control.	SAMPLE No.	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
	40	0	0	0	2	5	9	16	21	24	25	25	25	27	27	30	30	32
	41	0	0	0	4	8	19	25	28	29	29	31	33	34	34	36	36	37
	average	0	0	0	3	6.5	14	20.5	24.5	26.5	27	28	29	30.5	30.5	33	33	34.5
	38	0	0	27	43	48	52	54	—discontinued									
Stratified 30 days @ 10 C.	39	0	0	18	29	34	38	38	—discontinued									
	average	0	0	22.5	36	41	45	46										
Soil Tests in Greenhouse																		
Number of seeds—100																		
Date Started 3/1/30																		
Temperature C. 15-30°																		
Untreated control.	SAMPLE No.	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
	113	0	0	0	0	0	4	16	21	26	30	32	32	—	34			
	114	0	0	0	0	0	3	16	16	22	28	29	29	—	31			
	average	0	0	0	0	0	3.5	16	18.5	24	29	30.5	30.5	—	32.5			
	115	0	0	0	6	21	40	46	48	53	53	53	53	—	56			
Stratified 45 days @ 10 C.	116	0	0	0	6	32	43	50	52	56	58	60	60	—	63			
	average	0	0	0	6	26.5	41.5	48	50	54.5	55.5	56.5	56.5	—	59.5			

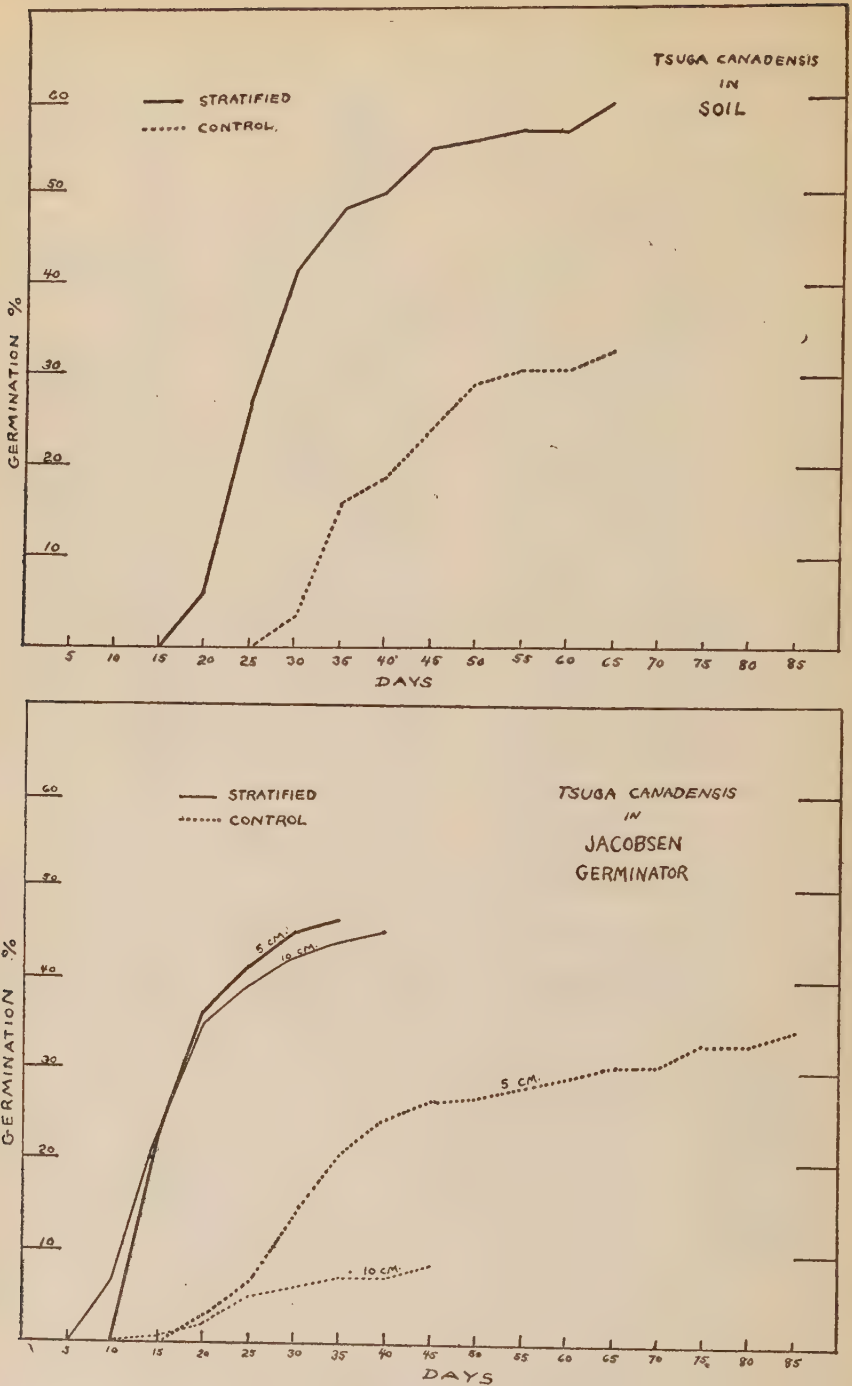


Fig. 1-2.—Course of germination of stratified and untreated hemlock seed in the Jacobsen germinator and in the soil.



tion than other common conifers. Most species germinate well at 10 cm. This characteristic corresponds to the natural seed bed conditions as pointed out by Frothingham (loc. cit.) and Sargent (7). Since the above tests were made, additional tests made by the Brown Company with Stainer's apparatus have given higher results than with the Jacobsen apparatus. This also tends to confirm the belief that high moisture is important.

The data presented here are admittedly meagre, but it seems most probable that after-ripening treatment is of great benefit in hastening the germination of seed of the eastern hemlock. The experiments made were defective in many respects. It is not known what effect the temperatures used in extracting the seed may have had in inducing dormancy. A comparison of naturally shed seed with that artificially extracted and cleaned would give the answer to this question. The best conditions of temperature, acidity and moisture for storage were not investigated; nor was the optimum storage period determined. Of the optimum conditions for germination little is yet known; it is possible, although doubtful, that when these are worked out completely, that equally good germination can be secured without after-ripening treatment. For the nurseryman fall-sowing is evidently the best practice.

#### SUMMARY

1. The average germination of ordinary commercial seed of eastern hemlock has been accepted as only 20-30 per cent.

2. Moist storage for one month at 10° C. resulted in an increase in germination of from 7 to 45 per cent in 40 days in the Jacobsen apparatus at 10 cm. water level, while 45 days storage resulted in an increase from 32 to 59 per cent in 70 days in soil.

3. Both germinative energy and the final germination percent were increased.

4. Dry, untreated seed germinated better with greater moisture supply.

#### REFERENCES

1. Barton, L. V. Hastening the germination of southern pine seeds. *Jour. For.* 26:774-785, 1928.
2. ———. Hastening the germination of some coniferous seeds. *Am. Jour. Bot.* 17:88-115, 1930.
3. Frothingham, E. H. The eastern hemlock. *Bull.* 152, U. S. Dept. of Agri. 1915.
4. Jacobsen, I. Oversigt over resultater af undersøgelser af træfrøforetaget ved Statsfrøkontrollen i aarene 1907-1924. *Dansk Skovfor. Tidsskr.* 724-742, 1926.
5. Moore, B., H. M. Richards, H. A. Gleason and A. B. Stout. Hemlock and its environment. I. Field records. *Bull. N. Y. Bot. Garden* 12:325-350, 1924.
6. Rafn, J. The testing of forest seeds during 25 years. Privately printed Copenhagen 1922.
7. Sargent, C. S. The Silva of North America 12:66, 1898.
8. Toumey, J. W. Seeding and Planting in the Practice of Forestry. N. Y. 1916.
9. ——— and C. L. Stevens. The testing of coniferous tree seeds at the School of Forestry, Yale University, 1906-1926. *Bull.* 21, Yale University School of Forestry, 1928.

# ACORN STORAGE IN THE SOUTHERN STATES

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The author reviews the literature on acorn storage and describes his own experiments. He recommends for conditions in the South that acorns be planted in the nursery directly after collection, thus simulating natural conditions. If this is not feasible he recommends stratification in moist sand and cold storage.

THE PROBLEM of acorn storage has been prominent in European forestry practice for several centuries—in fact, ever since the artificial establishment of forests became extensive in central Europe. With the increase in forest planting in the eastern United States acorn storage is becoming important in this country. Heretofore no experimental work has been done on acorn storage in the South. Recent experience has indicated that several methods of storing acorns commonly practiced in central Europe and in the northern United States cannot be used in the southern states with satisfactory results.

In the South, with its warm weather and alternating wet and dry periods, observations have shown that acorns, particularly those of the white oak group, often germinate during warm wet weather soon after they are shed in the autumn. Unless the seedlings take root before dry weather occurs a heavy loss will result from drying out. The acorns which have not germinated are subject also to desiccation and loss of viability during periods of dry weather which may occur any time during the autumn, winter, or spring. Unless adequately protected from drying out, ungerminated viable acorns lying on the ground or kept in artificial storage are similarly subject to deterioration and loss of via-

bility. The experiments herein reported were therefore undertaken to determine the best methods of storing acorns in the South.

## REVIEW OF PREVIOUS WORK

Because of the long-standing interest in this problem the literature contains many references to acorn storage. From a number of fundamental experiments with different seed storage methods Zederbauer (16) found that acorns which were stratified in moist sand and kept in a cellar retained the highest viability as shown by germination following storage. He concluded that seeds especially rich in stored food and with thin outer coats, such as acorns, are very sensitive to a low moisture content.

Oppermann (12) and Hauch (6) discuss in considerable detail the storage of acorns in Denmark. Hauch, contending that the storing of acorns in pits is uncertain and sometimes results in a considerable loss of germination, advocates the use of an acorn storehouse with a concrete floor and a roof covered with sod and thatched with a thick layer of straw. He states that the temperature in the house must be kept so that it goes neither much below nor much above the freezing point, and that it is well to have fresh air circulating freely in the hut. Hauch strongly emphasizes the fact that

the acorns must be watched with painstaking care so that they do not become too dry, too damp, or too warm, and are not exposed to frost. The acorns when first collected must be brought into a dormant state so that they neither sprout nor become so dry that they lose their viability. Frequent stirring of the acorns and weekly germination tests are advocated. Hauch recommends this method of over-winter storage to make spring planting of acorns possible and thereby reduce the danger of their destruction by mice, deer, pheasants, or pigeons. He also advocates planting the acorns the same day they are removed from storage to prevent drying out and the consequent loss of viability.

Holten (7) concludes that in order to preserve acorns two years it is necessary to use Hauch's method the first winter and to store them in dry sand beginning the following spring, and at such depth that the temperature will remain fairly constant.

Onlieff (11) describes a method of storage which is reported to be satisfactory for Russian conditions. A layer of dry oak leaves about 1 inch deep is spread on the ground on a protected north slope, and upon it a 2- to 3-inch layer of selected dry acorns is placed. They are then covered with more leaves and branches to protect them from the wind. When the winter has set in and melting has ceased, snow is piled up to a depth of 2 feet on the place where the acorns are buried. The snow is then covered with straw from 7 to 10 inches thick and left until spring. As a protection against rodents, the area is surrounded by a 1-foot ditch with inclined sides and embankments on the outer

side. The ditch also drains off surplus water.

In America the method of acorn storage generally followed has been stratification in sand. This method has been advocated by Douglas (4), Jack (8), Schenck (13), Tillotson (14), and Crumley (2). Where this cannot be done successfully, Toumey and Korstian (15) recommend keeping acorns in cold storage.

In order to obviate the necessity of over-winter storage, Harshberger (5) advocates the fall planting of immature acorns before they have passed into the dormant period. He contends that the growth of the immature embryos will continue without interruption and that they will develop into normal seedlings without passing through the resting period. From the standpoint of practical application, the planting of immature acorns is still a very doubtful procedure.

Delavan (3) stored acorns of three species of the white oak group—white oak, bur oak, and swamp white oak—and two of the black oak group—red oak and black oak—in closed, but not sealed, glass fruit jars as follows:

1. In the laboratory, without preliminary drying.
2. In the laboratory, after drying until they had lost about 5 per cent of their original weight.
3. In a refrigerator.
4. In a pit, buried about 1 foot under the surface of the ground.

The acorns stored in the refrigerator gave the highest germination. Those stored in the pit gave the next highest germination. It is evident from this



experiment that optimum conditions for acorn storage are moist atmosphere and low temperature.

For storing acorns in countries with warm or fluctuating climates Johannsen (9) suggests the use of an artificially-refrigerated cold storage room. He contends that in order to keep acorns in a viable condition constant low temperature is required. In his experiments he found that storing at a temperature between 1 and 2 degrees C. (33.8 to 35.6° F.) gave good results. He states that, while the temperatures ordinarily were maintained around 2 to 4 degrees C. (35.6 to 39.2° F.), they went up periodically during the summer months to 9 degrees C. (48.2° F.) and proved injurious to the keeping qualities of the acorns. With proper ventilation and low temperature Johannsen was able to keep acorns for more than three years but with a gradually decreasing viability.

#### FACTORS AFFECTING RETENTION OF VIABILITY

It is evident from the literature on acorn storage that the low temperature and high humidity in pits or in cold storage rooms preserve acorn viability best, while the temperature and moisture conditions in a dry cellar or heated room reduce viability. Low temperatures, high atmospheric humidity and high soil moisture are factors which favorably influence natural and artificial acorn storage. The influence of these factors in reducing respiration and reducing or preventing transpiration is regarded as important in seed storage.

In order further to test the applicability to North American conditions of the various methods of acorn storage

that have been proposed, the writer (10) carried out a number of experiments as a part of an intensive investigation of factors controlling germination and early survival in oaks. A moderately low temperature (33-38° F.) and high atmospheric or high soil moisture were found to be the most important factors controlling the retention of the viability of acorns in either artificial or natural storage. A supply of oxygen sufficient for respiration must also be available. These conditions were obtained in an artificially-refrigerated cold storage room.

Viability in species of the black oak group is somewhat more easily retained than in the white oak group due to the prevalence of delayed germination in the black oak group. An increase in temperature within the vital range, while tending to shorten the rest period, is insufficient alone to terminate it. The embryos of this group have a much higher fat content than those of the white oak group, and the need for a rest period and higher temperatures to hasten after-ripening is probably associated with enzymic action and the conversion of the fats into soluble carbohydrates during after-ripening and the early stages of germination. For these reasons the acorns of the black oak group do not germinate under natural conditions until spring and in order to retain their viability during the winter must not become too dry.

Acorns of the white oak group, on the other hand, do not possess the phenomenon of delayed germination and consequently are capable of germinating immediately upon being shed from the tree. Under natural field conditions such

acorns of the white oak group as escape the ravages of rodents and insects and do not lose their viability due to becoming overly dry, germinate early in the autumn and the seedlings take root promptly although they commonly do not make appreciable shoot growth until spring.

#### PRESENT STUDIES

From the results of the writer's (10) earlier studies which were conducted in western North Carolina and southern Connecticut it became evident that the storage methods commonly successful in the northern United States would not be widely applicable in the South without considerable modification. Accordingly in the autumn of 1927 additional experiments were undertaken in western North Carolina to determine the best storage methods for southern conditions.<sup>1</sup> Acorns were stored in each of the following ways:

1. A peck each of white oak, chestnut oak, and scarlet oak acorns was stratified in moist sand and buried 3 feet underground.

2. A peck each of white oak, chestnut oak, and scarlet oak acorns was placed in wire cages made of  $\frac{1}{4}$ -inch mesh wire screen and immersed in fresh running creek water.

3. A peck each of chestnut oak and scarlet oak acorns was stratified in sand and stored in an artificially-refrigerated cold storage room maintained at a temperature of about 33 to 40° F.

The white oak and chestnut oak acorns were collected and put in storage on October 3 and the scarlet oak acorns on

October 18. The acorns were removed from all the storage places and planted in the nursery on March 14 and 17, 1928. At this time 82.0 per cent of the white oak, 85.0 per cent of the chestnut oak, and 85.5 per cent of the scarlet oak acorns stratified and buried 3 feet under ground had germinated. The white and chestnut oak acorns had already developed roots, averaging over 2 inches long, and the scarlet oak had radicles averaging 0.7 inch long.

Most of the white and chestnut oak acorns stored in the running creek water had germinated during the first 15 days that they were under water and before cold weather set in. When taken from the creek in the spring the young radicles were black and a cutting test indicated a complete loss of viability. When the scarlet oak acorns were removed from the creek they too had germinated and the seedlings had radicles 1 to 2 inches long. A number of the roots were found to have been injured by some water insect or small animal which had gotten through the wire screen and had eaten holes in the radicles. A total of 54.5 per cent of the germinated scarlet oak had injured or broken radicles, but 96.0 per cent of these survived.

The acorns stratified in sand and kept in cold storage appeared to be in good condition when removed from storage. Some of the chestnut oak acorns had germinated while in cold storage, probably due to too high temperatures, at least for a short time.

When the acorns, which were stored under the three different methods, were

<sup>1</sup> The writer is indebted to A. L. MacKinney, J. H. Buell, and C. R. Hursh of the Appalachian Forest Experiment Station for material assistance in these experiments.

planted in the nursery it was found that they had retained their viability to the extent indicated by the following percentages of germination:

#### SUGGESTIONS FOR HANDLING ACORNS IN THE SOUTH

The results of the above-mentioned experiments when interpreted in con-

Methods of Storage	Species	Percentage of germination
1. Stratified in moist sand, buried 3 feet under ground.	White oak	82.0
	Chestnut oak	85.3
	Scarlet oak	85.7
2. Placed in wire-screen cages, immersed in running creek water.	White oak	0.0
	Chestnut oak	0.0
	Scarlet oak	69.0
3. Stratified in moist sand, kept in cold storage at about 33 to 40° F.	Chestnut oak	80.3
	Scarlet oak	90.7

The results of these experiments agree in a number of important respects with the earlier work on acorn storage. The acorns must be stored in a moist condition and at a low temperature to retain their viability. Even when stratified and immediately buried 3 feet underground acorns stored in the South cannot be kept from sprouting by this method of storage. The storage of acorns in fresh running creek water, even when every precaution is taken, holds no promise as a desirable storage method for the South. This agrees with the writer's (10) earlier results but does not agree with those of Cieslar (1). The acorns which were stratified in moist sand and kept in an artificially-refrigerated cold storage room were in the most satisfactory condition for planting when removed from storage in the spring. They not only retained a high degree of viability but also developed fewer and shorter radicles than those buried in a pit underground. The best storage method is the one which will keep the acorns moist and at a temperature low enough to prevent appreciable growth of radicle. Germinated acorns are very difficult to handle without breaking off or injuring the tender succulent radicles.

junction with all available information obtained through research and experience in the handling of acorns suggest the following practice as being adapted to the South.

Wherever the acorns can be protected from rodents or the rodents controlled by poisoning or trapping, or where this source of danger does not exist, the acorns should be planted in the nursery in the autumn as soon as they are collected and before they have dried out. This will eliminate all the trouble involved in artificial storage and more closely approaches their behavior under natural conditions on the forest floor. The acorns of the white oak group will germinate, the radicles develop, and the seedlings become established in the autumn, while those of the black oak group will germinate and develop rapidly with the first warm weather in the early spring.

Acorns planted in the nursery should ordinarily be covered with  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches of soil. Large acorns can be planted deeper than small ones. A leaf mulch is desirable to prevent drying of the upper soil, but should be removed



before the shoots appear above ground in the spring (10). Acorns that are not mulched should be planted somewhat more deeply than mulched acorns.

The planting of one-year-old nursery stock grown from fall-sown acorns will ordinarily result in a lower unit cost of the surviving trees in the established plantation than will direct seeding.

When necessary to hold acorns over winter they should be stratified in moist sand and immediately put in cold storage at a temperature of 33 to 36° F. If the acorns are not stratified in moist sand, they must be turned every few days to prevent heating and molding and the room must be kept damp to prevent excessive drying. The temperature should not be allowed to drop below freezing, particularly if the acorns are not stratified in sand during storage.

#### REFERENCES

1. Cieslar, A. 1896. Versuche über Aufbewahrung von Eicheln. Centralbl. f. d. gesam. Forstw. 22: 181-188.
2. Crumley, J. J. 1926. Constructive forestry for the private owner. 322 pp. New York.
3. Delavan, C. C. 1915. The relation of the storage of the seeds of some of the oaks and hickories to their germination. Mich. Acad. Sci. 17th Rept., pp. 161-163.
4. Douglas, R. 1888. Growing deciduous forest trees from seeds. Gard. and Forest 1: 23.
5. Harshberger, J. W. 1916. A new method of germinating acorns for forest planting. Amer. Forestry 22: 687-688.
6. Hauch, L. A. 1923. The cultivation of the oak (*Quercus pedunculata*) in Denmark. Quart. Jour. of Forestry 17: 35-50, 88-97.
7. Holten, A. 1920. Toaarig Opbevaring af Agern (Storing acorns two years). Dansk Skovforenings Tdsskr. 5: 191-198.
8. Jack, J. G. 1895. Germinating nuts and acorns. Garden and Forest 8: 6-7.
9. Johannsen, W. 1921. Orienterende Forsøg med Opbevaring af Agern og Bøgeolden. (Preliminary experiments on storing acorns and beech-nuts.) Det forstlige Forsøgsvaesen i Danmark 5: 372-390.
10. Korstian, C. F. 1927. Factors controlling germination and early survival in oaks. Yale Univ., School of Forestry Bul. 19. 115 pp.
11. Onlieff, A. 1915. (Method of preserving acorns for sowing.) Lyesnoi zhurnal 45: 255-259. Rev. in Forestry Quart. 13: 554-555. Rev. in Intern. Inst. Agr. Mo. Bul. Agr. Intell. and Plant Diseases 7: 956.
12. Oppermann, A. 1913. Overvintring af Agern. (Overwintering of acorns.) Denmark—Forstl. forsskom. Det. forstl. forssogsv. 4: 127-134.
13. Schenck, C. A. 1912. The art of the second growth or American silviculture. 206 pp. Albany.
14. Tillotson, C. R. 1915. Forest planting in the Eastern United States. U. S. Dept. Agri. Bull. 153. 38 pp.
15. Toumey, J. W., and Korstian, C. F. 1931. Seeding and planting in the practice of forestry. 2nd Ed. (In press). John Wiley & Sons, Inc., New York.
16. Zederbauer, E. 1910. Versuch über Aufbewahrung von Waldsämereien. Centralbl. f. d. gesam. Forstw. 36: 116-121.

# TREE DAMAGE BY THE RED SPIDER<sup>1</sup>

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Fine webs spun over leaves or leaves appearing gray and dusty or yellowish, may indicate the presence of the Red Spider, whose life cycle, habits, distribution, detrimental activities and control are here discussed.

**H**ARVEST mites and red spiders, at times serious pests to trees and plant life, are minute Arachnid creatures with a world-wide distribution. They are not really insects, although commonly so considered because of the similarity of their life histories and relations to the plant and animal world. Probably the species most frequently met in the eastern United States are *Tetranychus telarius* with general host habits and often a serious green-house pest, and *Bryobia pratensis*, the clover mite, which also at times attacks fruit trees. There are, however, numerous species of harvest mites and allied forms with food habits and general structure like these two. All attack vegetation in about the same way and may be combatted by similar measures. Relatively few of the species are commonly recognized as pests, chiefly because their very small size enables them to escape notice.

## DISTRIBUTION AND ABUNDANCE

The red spider (1) and all of its relatives are contained in the Order *Acarina* or *Acarida*, which included 133 genera with 450 species listed in the United States in 1907. In the Order are found species which are parasitic on

both plants and animals. Birds are commonly attacked by mites. A human trouble commonly termed "itch" is caused by a minute Acarid mite. Although the red spider is now generally recognized as a nursery pest, it is probable that most foresters are even more familiar with "red bugs" or "chiggers," which are the larvae of a small red spider form. The ticks that attach themselves to dogs, cattle, and sometimes to man are among the largest representatives of the group, which feed by sucking sustenance from their host. Some very serious diseases of both men and animals are now known to be spread by these relatives of the red spider. Warm and sunny climatic conditions seem most favorable to the order.

Among the trees recorded as attacked by red spider in Pennsylvania State Forest nurseries are Colorado blue spruce, Norway spruce, white spruce, Engelmann spruce, arborvitae, catalpa, honey locust, persimmon, tulip poplar, chestnut, and American elm. The spruces and elm probably suffer the worst. Citrus fruit trees in the South are often severely injured by red spiders and mites.

Since this report is written in the interests of forestry in Pennsylvania, the

<sup>1</sup> Presented at Conference of Pennsylvania Foresters, Mont Alto, Pennsylvania, January 29-30, 1930.

term red spider will be used hereinafter to designate those species that may feed on the leaves and succulent parts of trees and plants, while the term *Acarid* will refer to the general group.

European forest entomologists for some years past have made accurate determinations of the number and kind of insects hibernating in the forest soil and litter during the winter. By comparative studies over a period of years, it is possible to know which pest forms are on the increase, and to predict which ones may develop in hordes and become a serious plague. The remarkable fact emphasized by all such census work has been the high representation of red spiders and related life forms (*Acarids*). In practically every instance these made up from 44 to 92 per cent of the total counts on all sorts of sites, from sphagnum and lichen covered tundras of the North to the desert sands of the Sahara.

It is reasonable to believe that red spiders and their relatives are just as universally distributed in America as in Europe and Africa, yet only under exceptionally favorable conditions do they become a pest demanding active control measures for the protection of trees and other crops.

Almost every year forest nursery inspectors in Pennsylvania have reported the occurrence of red spiders in the nurseries of the State. In practically every forest tree nursery it is possible to find on needles and leaves the minute pale brown spots or dots that show the work of these creatures, even if they themselves have apparently disappeared. True red spiders (4) spin a dense fine web on the twigs and foliage on which they feed, if present in damaging num-

bers. The spiders are so small, however, that even under such conditions, a magnifying lens is required to see them.

#### DAMAGE BY RED SPIDERS

The life history of *T. telarius* is well understood, as this species has been known since before the time of Linnaeus. The female of the species over-winters on the lower part of various plants such as moss and grass, or hides in the litter on the ground. In spring it ascends growing plants and lays eggs at the rate of five to ten per day for a period of eight to twelve days. During hot, dry weather these eggs hatch in about four days and the young are fully developed ten to fourteen days later. This life cycle permits about six generations during a summer season, and if weather and all other conditions were favorable, a single mother might have offspring to the number of 750,000,000,000 by the end of the growing period, if the sexes were equally distributed. This explains why the red spider often becomes very injurious during a protracted drought, when plants are least able to resist the pest. Because of the limited water supply at such times, they cannot replace the sap withdrawn by countless minute but extremely greedy mouths. Under such conditions entire plants and even trees may be defoliated or killed, especially in nurseries where clean culture forces the pest to concentrate on single specimens. Red spiders apparently prefer to live and feed in colonies, in which condition they are afforded maximum protection from the fine mesh of webs they spin.

Although red spiders are not mentioned by Dr. E. P. Felt in his "Manual



of Tree and Shrub Insects," and are either not listed or only casually discussed in other publications on tree pests, they certainly deserve more consideration. Pennsylvania has had seven large forest tree nurseries within its borders. In four of these it has been necessary at times to take active control measures against spiders. The necessity would probably been more frequent and acute if good irrigation and shading facilities were not usually provided.

The dependence of red spiders on hot, dry weather, is helpful to the nurseryman, since he need not fear trouble under other conditions. This characteristic, however, has probably caused these small pests to be seriously underestimated and generally overlooked, since trees that suffer more or less severely from spider attacks at such times are commonly assumed to be suffering from drought. Closer examination would reveal the red spider as an important contributory factor in their failure.

District Forester H. M. Nicholas reported a very definite case of plantation loss from the red spider during the dry summer of 1929. This occurred in a plantation of 15,000 white pine trees planted in Roaring Brook Township, Lackawanna County, in 1915. In 1929 the trees averaged 10 feet in height, and some of them were 20 feet tall. Eight per cent of all the trees were killed outright by the red spider attack, and 7 per cent were injured to the extent that their foliage turned yellow and sickly in appearance.

When trees, especially evergreens, are planted, either for forestry or ornamental purposes, there is often injury and loss from spider damage. The

danger is greatest when trees are set on warm, dry south slopes, or on the sunny, south and southwest sides of buildings. Many trees die during their first year on such sites because red spider colonies develop and work serious injury before the trees recover from the shock of transplanting. Neglected lawns and abandoned fields often harbor the red spider, where it is ready and waiting to attack any new and favorite host that may be introduced. Sometimes the pest is present on nursery stock when shipped. In the tree nursery operated by the Pennsylvania Department of Highways near Lewisburg there has been considerable trouble with the red spider. It is possible that the infestation originated in the Mont Alto Nursery, as it was first noticed on stock that was transferred from the latter nursery, where the pest recurred over a period of five successive years, whenever weather favored it.

#### CONTROL MEASURES

This emphasizes the necessity of keeping nursery stock free of these mites. They can be combatted easily in the nursery or on individual ornamentals, but the forester can do little in a practical way to protect extensive plantations, if the pest is generally established, because of the excessive cost. A hard, driving summer rain is most effective in controlling infestations of red spiders. Planted trees and shrubs on lawns can be often satisfactorily treated with water, applied at high pressure with a hose, so as to destroy the spiders or wash them away. However, water treatment should not be considered sufficient in a nursery. All infested nursery stock should be thoroughly sprayed to guar-

antee that the pest is eliminated and will not be scattered far and wide to places where it may do much damage—often before its presence is known.

Any contact insecticide is effective against red spiders. Kerosene emulsion, other miscible oils, lime-sulphur and nicotine sulphate are all good. They should be applied twice, with an interval of about ten days between applications.

Powdered lime, wood ashes, flowers of sulphur, and soot sifted over trees when covered with dew, have been some of the measures used in the State Forest nurseries of Pennsylvania. The results have been beneficial, but careful spraying with insecticides is undoubtedly better.

The extent to which birds eat the red spider and mites is not known definitely. The pest is always worst on low growth in the open and on such trees as spruce, whose prickly needles discourage bird visitation. The United States Biological Survey (5) has made some very careful studies of the foods of birds based on stomach contents, yet only rarely are these life forms listed. This is explained by their extremely small size and fragile structure which renders identification impossible. There is little doubt that wrens, warblers, kinglets, chickadees, creepers, nuthatches, and vireos eat these pests. Such birds deserve protection for they are of the greatest importance in keeping under control nearly all kinds of injurious insects, as well as red spiders.

#### SUMMARY

It is probable that the red spider is doing more injury to trees in Pennsylvania than is generally realized. It is ad-

visable that foresters, nurserymen, and gardeners be informed about this minute pest and learn to recognize its presence. Sometimes the naked eye can detect the fine webs spun over the leaves or needles of host species, or they may look gray and dusty or yellowish, particularly after a period of dry weather. Such trees or shrubs should be carefully inspected with a good hand lens or reading glass, and in a surprising number of cases the pale pin-point feeding dots will be found. If the pests are still present, their pearly eggs or their remnants will be noticed, together with the busy eight-legged reddish mites. A twig or leaf which appears to be attacked by the red spider, if sent to the Department of Forests and Waters at Harrisburg, or to the Pennsylvania Forest Research Institute at Mont Alto, Pennsylvania, will permit of verification and will bring specific recommendations for helpful control measures, when requested.

#### REFERENCES

1. Comstock, John H. *The Spider Book*, Doubleday, Page & Co., New York City, 1920, pp. 85-88.
2. Russell, John. *Microörganism of the Soil*, London, 1923.
3. Tragårdh, Ivar. *Svenska Skogsvårdsföreningens Tidskrift*, 1928, pp. 795-809.
4. *Insects Injurious to Deciduous Shade Trees and Their Control*. United States Department of Agriculture Farmers' Bulletin 1169, p. 93.
5. *Food of our Important Flycatchers*. United States Department of Agriculture Biological Survey Bulletin 44, p. 63. Chapin, E. A., *Food of Vireos*, United States Department of Agriculture Bulletin 1355, p. 28.



## REVIEWS



**Betriebstatistische und betriebswirtschaftliche untersuchungen uber den Stadtwald von Villingen.** (Statistical and economic aspects of management of the City Forest of Villingen.) Gayler, Oberforstrat, *Allegemeine Forst und Jagd Zeitung*. Jan.-Feb.-Mar., 1930, pp. 38.

The management of the forest is subjected to a thorough analysis based on fairly comparable statistics and accounts kept over a period of 90 years.

Part I deals with the forest areas and their utilization. The forest proper contains 9200 acres, typical of the Black Forest highland. Climatic conditions and other site factors favor the development of raw humus, and drainage is poor, hence care is required in choosing economic and silvicultural measures.

Spruce, pine, and fir compose practically the entire stand. The small amount of beech present is to be increased and larch is to be introduced as a means of increasing soil productivity. The forest is now managed on the selection system.

The first management plan was made in 1837 and it has been revised every ten years except in 1917.

As a result of the clear-cutting systems employed previous to 1880, the forest consists mainly of even-aged stands sharply divided by area. In 1857 the mature age classes were rather normally distributed. Today the oldest age class

occupies 24 per cent of the area in contrast to a normal 7 per cent. This is balanced by a deficiency in the 61-80 year class, while the 1-60 year classes are normal. In consequence, cutting will, for a time, be concentrated on the surplus growing stock over 100 years and the normally stocked 81-100 year old stands. The time for cutting these stands will be extended so as to offset the lack of the younger age class; this will avoid the danger of soil deterioration and loss of increment.

Nearly all the stands over 60 years have been calipered. The recent stem tally, covering 88 per cent of the growing stock, makes possible accurate future calculations of the results of management. This inventory, including computation, cost 67 cents per acre of measured area or 0.7 cents per 100 cubic feet of timber.

Reliable comparison of the growing stock in 1927 with that in earlier years is possible only for the past 20 years. The reported utilization from 1907 to 1927, averaging 922,000 cubic feet a year, corresponds roughly to the average increment for the period. The average stand per acre has increased steadily from 3,725 cubic feet in 1837 to 5,100 feet in 1927. This increase is smaller than that in other units of the Black Forest, indicating that early cutting was relatively heavy. The total growing stock is now 47,450,000 cubic feet. The c. a. i. of approximately 107 cubic feet is



somewhat less than the p. a. i. due to the excess of the overmature age classes.

Around 24 per cent of the growing stock will be removed in the decade 1927-1936, or slightly more than the growth, which is estimated at 10,590,000 feet. This excess is justifiable since the measures for forest improvement will benefit future generations. The cut of saw timber will not exceed growth, however. Of the 10 years' cut 9 million feet will form the main crop, and about 2½ million feet the intermediate crop.

Part II deals with the statistics of operation. By comparing these data between different periods, one may judge of the economy of management and where improvements may be made. Records show that the intermediate crop has increased sharply since the first decade, and that the ratio of saw logs to fuel wood has greatly increased. In this respect the forest ranks high in comparison with the State forests of the region. The annual cut has risen from 666,000 cubic feet in the decade 1837-1846 to 1,065,000 feet in 1927. The percentage of free fuel wood given to citizens has fallen from 50 per cent of the 1870 cut to only 10 per cent in 1927. This has made it possible to sell more saw-timber, the proceeds from which go into the city treasury. The small percentage of tops produced and the high average volume of the six classes of saw logs indicate high quality timber.

Periodic gross incomes are available in total for the entire period but were not separated by stem classes until after the war. The steady rise in income per cubic meter previous to the war, which was paralleled by a rise in lumber prices, contrasts sharply with the post-war fluctuations. The 1927 price was only

1.56 times the 1907-1913 average price which indicates that the price of wood has not kept pace with the general rise in prices. The price of fuel wood has risen more slowly than that of saw logs, due to the greater use of coal. The average gross income of \$14.80 per 100 cubic feet in 1926 was higher than that from any State forest.

Logging costs increased 79 per cent from 1907-1913 to 1927. The corresponding rise in the State forests was 96 per cent. These costs were 20 per cent of the gross income in the decade 1877-1886, 13 per cent just before the war, and from 15-18 per cent since. Improvement cuttings, being on a day wage basis, cost more than the regular cuttings, which are paid for on a piece work basis. In 1927 it cost \$2.24 per 100 feet to log the main crop and \$5.95 for the intermediate cut. The corresponding costs in 1913 were \$1.26 and \$2.76. Improved hauling conditions resulting from extension of the logging road system have prevented logging costs from rising more than wages since the war, even though labor efficiency has not increased.

Net returns per 100 cubic feet rose from \$5.25 in 1877-1886 to \$12.10 in 1926 and \$15.15 in 1927. The average net return for all forests in the region was \$9.10 in 1926. By-products, principally hunting licenses, yielded \$.13 per acre in 1926.

Cultural costs have been quite high because large areas had to be planted. Additional costs were incurred for drainage, which was commenced as far back as 1837. Drainage costs are considered as capital expenditures. Normal cultural costs may be expected after the drainage system is completed and the under-stock areas are brought back to nor-

mal. Planting, including soil preparation and plant production, costs \$27.00 an acre (1550 trees).

It has been found much cheaper to produce the necessary plants than to buy them. While formerly the stock was produced in eleven small nurseries, there is now but one central nursery with a utilizable area of 2.9 acres. Four and five year spruce transplants are produced for \$3-\$4 per 1,000.

The costs of the road network are of especial importance since the capital expenditures for construction and current expense for maintenance are reflected in the financial returns from the forest. The former are met through increases in the annual income, while the latter is met from the present annual income. The road system has required much extension and improvement.

The City forest is relatively less accessible than the State forests but is making progress. Annual maintenance costs have risen from \$30.40 per mile in the decade 1867-1876 to \$286.75 in 1927. The heavy recent costs are due largely to the neglect of the roads in 1915-1923.

Important factors in road building and repair are the high cost of paving materials and the heavy motor traffic. At present rock is hauled up into the mountains from outside the forest, although there is local rock which probably could be utilized. As to traffic, a rationalization of building and repair methods is essential. The old hand methods which are still largely employed must be discarded. An 8-ton motor roller recently purchased is raising the efficiency of construction and repair work and has already justified its cost.

Operating income and expense and net returns indicate only current financial progress; alone they give no clue to the results of management. The accounts kept since 1867 are inadequate as a basis for determining profit, since they were not always segregated from those of the city, and since the fiscal periods of the forest and of the city did not always coincide. The percentage rise in gross income was less since 1913 than before, because of the post-war deflation. Average net income would be greater were it not that free wood, or cash in lieu, given to citizens takes 20-25 per cent of the net proceeds. The Ordinance of 1922 limiting the number of rights is rapidly remedying this; eventually they will disappear. Taxes account for 8 per cent of total expense as against 2 per cent pre-war. The operating ratio has risen to 54 per cent in 1924-1927 as against 46 per cent in 1907-1913. This compares favorably with the State forests. Omitting free wood and other rights, the net income is \$10.73 per acre, the highest in the region.

The forest income covered only 17 per cent of the City's expenses in 1924-1927, in comparison with 35 per cent in 1907-1913. This is to be expected in view of the City's growth.

Part III discusses the calculation of the financial results of management. Improved methods of bookkeeping which will show the relation between utilization, rent, and capital, the changes in the value of the growing stock, the division of outgo into expense and investment and the return on the investment, and will furnish the data necessary to develop the growing stock to its full earning capacity are provided for in the revised management plan. This

provides for an opening balance as of April 1, 1927. After 10 years the closing balance will indicate properly the change in the value of the investment.

In the opening balance the assets included soils at sales value, and timber at cost value for stands under 40 years old, and sale value for stands 40 years and over, based on current prices. Values for the latter stands were computed separately for the measured and unmeasured portions. Net values per 100 cubic feet for fir and spruce ranged from \$16.91 for class I logs to \$10.40 for class VI, and for pine, from \$18.80 to \$5.55. The total value for all timber was appraised at \$5,939,175 or \$638.75 per acre, and for soils at \$515,425.

A large capital is invested in roads, but so far as existing roads are concerned their worth is expressed in the values of the soil and the timber. Outgo for new roads will be first booked as capital expenditures and gradually apportioned. No depreciation will be figured on roads, for their life will be extended through repair. Depreciation on drainage ditches, tools, etc., will be set up.

Miscellaneous assets, including buildings, tools, etc., are relatively unimportant, and amount to only \$125,775. Total assets amount to \$6,580,375. There are no debts.

After 10 years, provided the accounting procedure is unchanged and the same unit values used, the *real* net yield will be the difference between the end and beginning values of the forest assets plus current net yields. It will also be evident how the real yield from the forest has been distributed between net income and capital improvement and whether or not the net realized yield is

combined with a reduction in capital.

A recapitulation for 1927 shows incomes and outgo, additions to and deductions from assets, and profit and loss. The same check, except as to the growing stock, should be made annually. Then after 10 years the closing balance can easily be presented. The growing stock account can not be revised annually; the 10-year remeasurement will show what changes have occurred. The annual incomes from timber will appear in total regardless of whether the utilization corresponds with the monetary return or not.

In this way the rent capacity of the forest will be clearly apparent. The periodical gain, composed of the current net yield and the net additions to capital, when contrasted with the initial capital will give the percentage earned on the investment. This will be of significance in comparison with similar figures for other forests.

There is clearly a need for similar calculations on our American forests. Regardless of whether a given forest is managed as a separate unit, producing timber for sale on the open market, or whether it is owned by a manufacturing organization or a public utility, serving as the source of raw materials or primarily for the protection of other values, its earning capacity should be determined. For example, if a given holding is found, after analysis, to be furnishing raw materials to a manufacturing plant more cheaply than they can be obtained elsewhere, its retention under sustained yield management is justified, regardless of whether it is earning an "adequate" return or not.

Coöperative forestry certainly stands to benefit by the adoption of definite



accounting procedure. No attempts to establish the necessary credit facilities can be successful until such steps are taken. The sooner they are taken the sooner will the fog lift from the sea of strife on which the good ship Private Forestry is embarked.

BERNARD FRANK.



**The Utah Juniper.** *Utah Forester's Club, Department of Forestry, Utah State Agricultural College, Logan, Utah, May, 1930.*

"The Utah Juniper" is the name of a new forestry publication which will be issued annually by the Utah Forester's club, of the Utah State Agricultural College, Logan, Utah. The book is named in honor of a huge old Utah Juniper tree, *Juniperus utahensis*, in Logan Canyon, and a likeness of the tree in natural colors appears on the cover of the first number.

The first issue of "The Utah Juniper" was released on May 10. This number is dedicated to President E. G. Peterson of the college, who contributed the leading article, entitled "An Opportunity in Forestry".

In his article, President Peterson points out that the college has the only forestry school in an area extending from the Salmon River on the north to the Colorado River on the south, and from beyond Green River in Wyoming to the western boundary of Nevada. This vast area comprising nearly one-tenth of the area of the continental United States, supports a livestock industry valued at about \$215,000,000 and 80 per cent of the feed required for millions of cattle and sheep is supplied by the native

range lands. The importance of forest and range cover in the protection of watersheds and streams is also forcefully shown.

Dana Parkinson, Assistant Regional Forester in charge of Public Relations work for Region IV of the United States Forest Service, in an article entitled "Public Relations and Forestry", strikes the fundamental note in modern business methods with the definition:

"Public relations means the *creating* of opportunities to *familiarize* the public with the forestry profession". Mr. Parkinson's article is concise and draws an interesting analogy between the establishment of public confidence in forestry and President Hoover's restoration of public confidence in industry after the recent stock market crash. The article must be carefully read to be fully appreciated.

C. L. Forsling, Director of the Great Basin Experiment Station, under the title "Research Needs in The Intermountain Region", summarizes the most outstanding research problems of the region. According to Mr. Forsling, the resources of every available agency, including the states, the federal government, the private owner and educational institutions should be directed at once toward a coöperative solution of the problems.

"Forests and Foresters", by F. S. Baker, Associate Professor of Forestry at the University of California, explains how the opportunities for intensive management of forest lands in the intermountain area are actually better than in California and the Pacific northwest. The field season in the latter regions is devoted largely to fire control work, while in the high mountainous country

of Utah, particularly, the menace of fire is much less.

T. G. Taylor, Head of the Department of Forestry and Range at the College, writes of the development of instruction at work in his department. He also states that the college is coöperating with the federal government under Sections 4 and 5 of the Clark-McNary Law. An extension forester is employed on a half-time basis, and a forest nursery is being developed as rapidly as funds will permit.

Stories, poems, and short articles of local interest make up the balance of the 1930 number.

CHARLES M. GENAUX.



**Contributions to the Problem of the Relation Between the Forest and water in Japan.** By Tokutaro Hirata. *Imperial Forestry Experimental Station, Meguro, Tokyo, Japan, 1929.*

Increasing demands on the yield of the mountainous areas of Japan of water for irrigation of rice fields, for hydro-electric power development, and the damaging effects of floods and erosion resulting from heavy typhoon storms, was the occasion of instituting researches into the relation of forests to water as early as 1906. This paper is one of the first reports of these researches which is readily available in the English language.

The researches included the following main subjects:

1. Forest meteorology.
2. Comparison of precipitation with-in and without forests.
3. Comparison of the discharges of

streams under various kinds of surface conditions within drainage areas.

4. Comparisons of stream discharges before and after deforestation of the same drainage basin.

Japan is mountainous, with short, steep, deeply incised drainage channels, and is abundantly watered in two distinct rainy seasons. Annual precipitation amounts to about 2,000 mm. or nearly 80 inches. Forests cover 47 per cent of the land surface in Japan proper. An additional 10 per cent is covered with grass. Any break in the mantle of vegetation accelerates erosion of the soil seriously to damage the restricted rice paddies in the narrow valleys.

Studies of precipitation within and without forests to determine the interception of rain by the forest have been extensively made for several forest types. Results are summarized in the following table:

PERCENTAGE OF RAINFALL INTERCEPTED

	BY FOREST CANOPIES	
	For a single rain.	For total precipitation.
Total mean	31.8%	19.9%
Mean for Sugi ( <i>Cryptomeria japonica</i> )	35.0	21.0
Mean for Hinoki ( <i>Chamaecyparis obtusa</i> )	36.0	26.0
Mean for Broad-leaved forest	24.0	17.0
Mean for Akamatsu ( <i>Pinus densiflora</i> )	18.0	9.0

When, however, a portion of rain flowed down the trunks of trees in Sugi or *Cryptomeria* forests the net interception proved to be 13.2 per cent. A similar reduction for other forest types is assumed to be applicable. When rain is accompanied by fog differences in the catch of rain due to interception may not only be zero but may be negative,

indicating that the catch within the forest is greater than in the open. In foggy months the catch within the forest may exceed by 10 per cent that in the open.

Studies in the comparison of the discharges of streams under various types of vegetative cover in drainage areas are of particular interest to foresters. Three small drainages in each of three districts were submitted to measurements.

SIX-YEAR MEANS OF RUN-OFF COEFFICIENTS  
BY AREAS

Ota district; annual precipitation 1600 mm.	
(a) young wood cover . . . . .	53.1
(b) coniferous forest cover . . . . .	44.8
(c) broadleaved forest . . . . .	58.4
Kasoma District; annual precipitation 1650 mm.	
(a) coniferous forest . . . . .	25.3
(b) broad-leaved forest . . . . .	35.2
(c) non-forest (grass cover) . . . . .	30.2
Asio district; annual precipitation 2300 mm.	
(a) broad-leaved forest . . . . .	45.9
(b) non-forested, partly damaged by smelter fumes . . . . .	24.1

The author explains the low run-off coefficient from the non-forested area of the Asio district as due to "better percolation", since there is no surface soil. It is difficult to understand how this can be in view of recent studies elsewhere on factors affecting run-off. Bare soils have been found to yield higher run-off coefficients than soils covered with natural vegetation.

The comparison of stream discharge before and after deforestation of the same basin area contains particular interest as being an experiment very similar to the Wagon Wheel Gap Stream flow experiment.<sup>1</sup>

The broad-leaved forest area of the Ota district was cut in 1914, and removal of timber was completed in July, 1915. Observations similar to those prior to cutting were continued

until 1919. "After clearing, the area remained generally as a grassy land with zebra grass and by the end of the experiment, young broad-leaved trees, of a few feet high were seen here and there". In comparing the coefficients of the periods prior (1911-1914) and after denudation (1915-1919), the author finds that after denudation the expected run-off coefficient if forested was 57.5 per cent, whereas the actual coefficient was 64.8 or 7.3 per cent greater. For 1916, when the greatest run-off occurred, the difference was 11.6 per cent. These differences are on the order of the amount of interception by the forest, and the author concludes that the difference in run-off may be attributed to this cause.

These results are strikingly similar in effect to those of the Wagon Wheel Gap experiment. Likewise the concept of denudation is similar. The description of the so-called denuded condition quoted above indicates that a mantle of vegetation completely clothed the drainage area in the second period.

These two stream flow experiments, one in America and the other in Japan, have indicated an important result, which is not included in the conclusions. It is, namely, that when the characteristics of the soil profile are not changed little difference in the absorptive condition of the soil mantle is to be expected: For the soil is in the final analysis the principal absorbent of rain, not the forest covering. If the soil in either case had been completely bared of vegetation a striking difference in run-off would without doubt have occurred.

It is at this point that special caution

<sup>1</sup> Bates, C. G. and A. J. Henry. Forest and Stream flow experiment at Wagon Wheel Gap, Colorado, U. S. A. Mo. Wea. Rev. Supplement No. 30. 1928.



is to be used in applying results of streamflow experiments, to catchment areas where the soils have been completely bared of vegetation by cultivation, by fires, by over-grazing, or by smelter fumes, which produce soil erosion at a rate far in excess of that under the protective mantle of vegetation, of grass or high forest. These experiments demonstrate that lowly graminaceous vegetation may have a value in watershed protection approximating that of a high forest, rather than depreciating the utility of a forest in erosion and water control.

W. C. LOWDERMILK.



**The Influence of Forests on Climate and Water Supply in Kenya (British East Africa).** By J. W. Nicholson, *Forest Adviser to the governments of Kenya and Uganda, with a foreword by A. Walter, Director, British East African Meteorological Service: Forest Department Pamphlet No. 2. (Undated.)*

Mr. Nicholson has drawn attention in this paper to certain phases of the controversy of the influence of forests on rainfall which merit careful consideration. In the foreword Mr. Walter suggests that differences of opinion by various authorities arise from "too violent generalization". Mr. Nicholson challenges conclusions in two recent papers by Raphael Zon (1) and C. E. P. Brooks (2); the former is protagonist for the view that forests induce rain, and the latter takes the opposition view. Mr. Nicholson has undertaken a commendable task to discover reasons for the

divergent conclusions of these two authorities.

Climatic conditions in East Africa, within equatorial regions are under the influence of two general atmospheric currents, and are the scenes of intense convection currents which arise from high insolation, especially at the lower elevations. Evidence of progressive desiccation are marked in this region. It becomes a problem of particular as well as vital interest to discover if such desiccation is within human control. Mr. Nicholson, in surveying our present knowledge on the possible influence of forests on water supply, believes that it is impossible to generalize: that it is necessary to determine the extent of this influence by type regions. The governments of Uganda and Kenya of British East Africa, being regions of intense convection characteristic of the equatorial zone, are cited as an example of conditions where influences of forests on rainfall may be of high importance. It is worth while to examine Mr. Nicholson's conclusions in some detail. The first conclusion is:

" . . . That there are certain regions of the world which include at least parts of Kenya and Uganda, where the total rainfall is likely to be affected by changes in the covering of vegetation not only appreciably but possibly enormously".

Brückner (3) (1905, p. 438) cites the calculations of John Murray (1887), in which the run-off of the peripheral land area of the earth is 22 per cent of the total rainfall on the land. Brückner's balance sheet (Ibid. p. 443) shows a value of 22 cm of the total of 98 cm average precipitation on the peripheral land area as contributed by the ocean. The remaining 76 cm are derived en-

tirely from the land. In this calculation only 29 per cent of the land precipitation comes directly from the ocean. River run-off draining the peripheral land area closely agrees with this figure. Milham (4) (1918) places the world's total run-off at 20-30 per cent of the total precipitation on the drained areas. Zon (1912, p. 21) makes use of Brückner's balance sheet to indicate the importance of the land-evaporation-precipitation within the ocean-land-evaporation-precipitation cycle to indicate the probabilities that rainfall of the interior areas is made up chiefly from evaporation and transpiration from the land. The reviewer (5) (1926) has indicated the probabilities of the relay of moisture by monsoon winds into the interior of China. An important factor, apparently omitted by Brückner, is called attention to in the discussion of this paper, that re-evaporated moisture from the land may be blown beyond the land. Brooks 1928 (op. cit.) cites the work of Wüst (6), 1922, in which this factor is designated as X. Thus the contribution of the ocean to peripheral land area is equal to the total run-off Plus X. Estimating that X or off-shore wind-blown moisture is one-half of the on-shore contribution, the moisture of land rains consists of two-thirds direct from the ocean and one-third from re-evaporation, including transpiration from the land.

Since Wüst's X is an indeterminate quantity, it is clear that the balance sheet of the water cycles can only be approximated. The important consideration to which Mr. Nicholson draws attention is that this value X may vary widely. Where it is low, the probabilities are that a much larger proportion

of the precipitation is made up of land moisture. The Nile River discharges only 10 per cent of the fall of rain on its catchment area. There is left therefore 90 per cent of the rain to be accounted for by Wüst's X, and a revolving water capital within the region of Uganda and Kenya. Since the rainfall of this region is chiefly due to convectional instability or convectional thunderstorms, it is possible that a large portion of the rainfall, which doubtless, is much greater than the average for the peripheral land areas, is derived from local evaporation.

The fact which requires determination to support Mr. Nicholson's first conclusion is that a forest returns to the atmosphere a larger amount of moisture than other types of vegetation, cultivated fields or barren ground. No experimental studies are available to determine if important differences exist for climatic zones in which British East Africa lies. The Emmenthal Experiment in the North Temperate Zone reported by Engler (7), 1919, shows run-off factors for the Sperbelgraben, fully forested, and Rappengraben, chiefly covered with grass, as 55.1 and 55.2 per cent, respectively (p. 556). No significant difference in total combined evaporation and transpiration occurred in this instance. The Wagon Wheel Gap stream flow experiment reported by Bates and Henry, (8) 1928, however, shows a difference between Watersheds A, forested, and B, cut-over, of 29.3 and 34.9 per cent, respectively (p. 41). It can not be known if the factor X would remain constant for regions in temperate climate in which these elaborate experiments were conducted. Hirata, (9) 1929, reports (p. 33) that the coefficients of run-off before and after deforestation from the same

drainage basin in Japan make an abrupt increase in the third year following cutting and then to decrease gradually in the former value. The amount of increase in run-off in the third year is in the order of the portion of rainfall which is expected to be intercepted by tree crowns of the forest cover. Bates and Henry (op. cit. p. 64) attribute the principal difference in run-off coefficients to variations in evaporation opportunity occasioned by the amount of interception and rate of melting of snow. It thus appears probable that the relative amounts of interception by a dense forest and a thin cover of herbaceous vegetation may vary widely and in favor of the former in the return of water vapor to the air.

The assumption in these comparisons is that the soil coating of landscapes has not been affected in any important degree and enjoys protection by a complete mantle of vegetation of low or high degree. An entirely different factor enters into the relationships, however, when the soil is entirely bared of its vegetation, by cultivation, overgrazing or other means. Experimental studies by the reviewer have shown that the run-off coefficient from a bared soil surface is increased to important proportions over that of similar soils completely mantled with vegetation. The stream-flow experiments of Engler, Bates and Henry and of Hirato do not include such comparisons. It is of first importance that this distinction be made in all studies of this nature. It is not clear whether such contrasting conditions are involved in Mr. Nicholson's first conclusion.

The second conclusion is:

"That in East Africa trees and deep rooted shrubs contribute more moisture to the air than herbaceous vegetation or bare soil and that they are therefore more likely to influence rainfall than the latter type of vegetation."

This conclusion does not find support in recorded streamflow studies, but is based on an assumption from observation. It clearly requires experimental determination. So much depends upon the climatic features of a region, as Mr. Nicholson has indicated, that it is unsafe to bring the results of studies in widely different climates to the support of this conclusion. Ototzky's (10) studies, 1898-1899, tend to show that forests draw more heavily on water than steppe vegetation. Insofar as graminaceous vegetation matures before soil moisture is reduced to the wilting point this is clearly true. It is questionable, however, if forest trees draw on soil moisture at greater depths than does a cover of brush or low perennial vegetation. Investigations into this question in East Africa would be of highest value in answering this question for that region.

The third conclusion is:

". . . . That under favorable circumstances mountain forests in East Africa can induce occult precipitation up to at least 25 per cent of the total annual rainfall."

The basis for this conclusion likewise clearly requires determination. That occult condensation in forests, within fog belts and above the cloud line reaches important amounts becomes apparent with each study of fog and cloud drip from forests. Descombes, (11) 1922, and Marloth, cited by Mr. Nicholson, as well as other studies mentioned by Brooks, and more recently by Hoge of the Mt. Wilson Observatory, California (unpub-



lished), have disclosed probable important sources of water supply. Lebedeff, (12) 1928 (p. 462), among others has measured intra-solum condensation which under certain circumstances may include appreciable contributions to water supply. So many factors are involved in this type of condensation that it will be necessary to make measurements to answer the question involved.

The fourth conclusion is:

"That forests have little or no influence on cyclonic rain and that the problem does not concern Kenya."

Mr. Nicholson follows Brooks in concluding that forests can have little influence on cyclonic rain. The classification of precipitation into orographic, cyclonic and instability showers (convictional storms) removes much of the confusion in the question of the influence of forests on rainfall. If under certain conditions of precipitation the forests have little influence, there are definite indications that under other conditions, such as convectional precipitation, they may have an important influence.

The fifth conclusion is:

"That in the case of monsoon rainfall the local effect of forests on rainfall is limited to a maximum of about three per cent, but the regional effect may be greater."

The magnitude of possible increase of rainfall by the orographic effect of forests, estimated by Brooks at 3 per cent, can not be large. Any effect on monsoon rainfall must operate to relay moisture in the path of seasonal winds. A certain amount of moisture would be relayed in the absence of forests or any vegetation. The question, therefore, becomes one of whether and how much a

forest cover on a landscape will relay moisture more than any other type of vegetative mantle or than a barren landscape. A measure of such difference is to be found in changes in volume of run-off from these regions. Thus if the destruction of forest vegetation increases the total run-off from a given catchment basin, then it may be assumed that the relayed moisture is reduced by that amount. Quayle, (13) 1922; 1923, has adduced evidence of a general nature to indicate the possibility of moisture relay from playa lakes caused by increased run-off from deforested and cultivated areas in Australia. Zon has indicated such a possibility for America (op. cit. 1912), where the probabilities are not as great as the denudation and cultivation in North China reported by the reviewer (op. cit. 1926). This type of relaying of moisture can exist at its best in only two continents.

The sixth conclusion is:

"That wherever meteorological conditions in East Africa are favorable to the production of instability (convictional) rain the possibility and quantity of such rain is greatly increased by the presence of forests."

Such becomes an interesting hypothesis for researches to discover how important an increase in rainfall is due to forests in comparison with other forms of natural vegetation or cultivated crops. It is quite possible that a water capital may be built up through a number of decades in this region by forest growth surrounded by mountain barrier ranges. Consequently foresters and climatologists will follow with particular interest the establishment of the projected meteorological service over East Africa, in coöperation with re-

searches into the influence of forests on water supply. Mr. Nicholson in his introduction expresses the fear that his paper is premature due to the paucity of meteorological and forest data for East Africa. The paper nevertheless serves as an excellent analysis of the problem to be quantitatively studied, and furthermore to indicate the policy of increasing forest area. Certainly afforestation of uncultivated lands will not damage the country but for its influence in the control of erosion and supply of materials, will be a safe policy. It may be found by such studies to be of additional value in maintaining a greater number of rainy days of convectional thunder showers than would exist if the forests were allowed to disappear, and in other ways.

W. C. LOWDERMILK.

#### REFERENCES OF REVIEWER

1. Zon, Raphael. Forests and water in the light of scientific investigation. Reprinted (1927), Appendix V, Final Report of National Waterways Commission, 1912. Senate Document No. 469, 62nd Congress, 2d Session.
2. Brooks, C. E. P. The influence of forests on rainfall and run-off. *Quart. Jour. Royal Meteorological Society*, Vol. 54. No. 225. 1928.
3. Brückner, Eduard. Die Bilanz des Kreislaufs des Wassers auf der Erde. *Geographische Zeitschrift*. 11, 8 Heft 1905.
4. Milham, W. I. *Meteorology*. 1918.
5. Lowdermilk, W. C. The changing evaporation-precipitation cycle of North China. *Proceedings. The Engineering Society of China*, Vol. XXV, No. 5. 1926.
6. Wüst, G. Verdunstung und Niederschlag auf der Erde. *Berlin Zs. Ges. Erdk.* No. 1-2. 1922.
7. Engler, Arnold. Einfluss des Waldes auf den stand der Gewässer Mitteilungen der Schweizerischen Zentralanstalt für das Forstliche Versuchswesen, XII Band. Zurich. 1919.
8. Bates, C. G. and Henry, A. J. Forest and stream flow experiment at Wagon Wheel Gap, Colorado. *Mo. Weather Rev. Supplement No. 30*. Washington, 1928.
9. Hirata, Tokutaro. Contributions to the problem of the relation between the forest and water in Japan. Imperial Forestry Experimental Station. Meguro, Tokyo. 1929.
10. Ototzky, O. Der Einfluss der Wälder auf das grundwasser. *Zeitschrift für Gewässerkunde*, 1898-99. v. 1:214. 278-290; v. 2; 160-174. Berlin.
11. Descombes, P. Les forets, les pluies et les condensations occultes. *Annu. Soc. Meteor. France*. Paris 66. 1922-23.
12. Lebedeff, A. F. The movement of ground and soil waters. *Proceedings and Papers. First International Congress of Soil Science*. Washington, 1928.
13. Quayle, E. T. Local rain producing influences under human control in South Australia. *Proc. Roy. Soc. Victoria*, Vol. XXXIV. 1922.



## BRIEFER ARTICLES AND NOTES



### STOP ROCKING THE BOAT!

Whether there *is* any such thing as Industrial Forestry in the United States or not may be debatable, but it is an assured fact that there *will be* no substantial development in private forest practice unless the "lily-white" element in the profession stops rocking the boat and lets those who are plying the oars of silviculture and management on the troubled seas of exploitation steer the course of progress.

Such emanations as "Deforested America" and the "Letter to Foresters" unquestionably have an effect on the mind of executives who are charged with handling large-scale timber properties and who are trying to make them earn a reasonable income on the investment in these days of terrific competition. This effect is to shake their faith in forestry as a common sense business enterprise whose proponents should command the respect and confidence of timber operators.

This, above all, is no time for altruistic propaganda. Stop rocking the boat!

A. B. RECKNAGEL.



FIRST AWARD BY PACK FOREST EDUCATION BOARD

Making its first award of fellowships ranging up to \$1800 a year for training leaders in forestry, the Charles La-

throp Pack Forest Education Board announced its selection of five Americans and one Canadian for the year 1930. The winning candidates were chosen from about 90 contestants.

The fellowships were established to encourage men of unusual intellectual and personal qualities to obtain training that will equip them for important work, either in the general practice of forestry, in the forest industries, in the teaching of forestry, in forest research, or in the development of public forest policy. The successful candidates are:

James Lindsay Alexander, Assistant Professor, College of Forestry, University of Washington, Seattle, Washington. To make an investigation of forest survey methods with the object of developing the needed precision with the least cost, at the University of Toronto, Canada, the University of Washington, and in the forests of the Eastern and Western United States.

Ralph Caird, graduate student, University of Chicago. To make a general study of forestry at the School of Forestry and Conservation of the University of Michigan, and to do advanced work in tree physiology and pathology.

Bernard Frank, Assistant Forest Economist, United States Forest Service, Washington, D. C. To make studies at the University of Wisconsin and field investigations in the Lake States of land classification methods and land



utilization technique especially as applied to forest lands, together with the preparation of a program of land use for a specific region.

George Ritchie Lane, Forester in charge of reforestation, Canada Power and Paper Corporation, Grand' Mere, Province of Quebec, Canada. To make field investigations of the planting, growth, and yield of pulpwood species in the Maritime Provinces of Canada, in the hope of reducing the costs of reforestation.

Raymond Frank Taylor, Forest Examiner, United States Forest Service, Juneau, Alaska. To make studies of the silvicultural management of coniferous forests at the School of Forestry, Yale University, supplemented by field work in Washington and Alaska.

John Burton Woods, Forester, Long-Bell Lumber Company, Longview, Washington. To make field investigations and to gather material on forestry as practiced in private timberlands and to write a book on the application of forestry to private lands.

During the coming autumn the Forest Education Board will receive applications for the award of approximately eight additional fellowships for 1931-32.



#### VOCATIONAL FORESTRY IN GEORGIA HIGH SCHOOLS

In the spring of 1929 the Georgia Forest Service conceived a plan for introducing forestry in the vocational agricultural schools of Georgia, and submitted it to the director and supervisor of vocational agriculture of the state securing his hearty approval and

coöperation. The vocational teachers were presented the plan at their spring district conferences and gladly offered their services.

During the summer of 1929, the work was launched by the teachers acquiring school forests of ten or more acres. Members of the staff of the Georgia Forest Service surveyed these forests and outlined in detail the management plans to be followed. Colored maps were made which the schools now have displayed in their class rooms.

One hundred schools had school forests for use during the scholastic year of 1929-30. The character of the forests varies greatly; old fields coming back into forests, cut-over lands, pine, hardwood, mixed stands, established forests with poor and good stands. An effort was made to acquire areas that were typical of prevailing conditions and as a result they represent a wide range of problems.

Each school has an area for reforestation. Tree seed is gathered and planted in seed beds operated by the schools to grow seedlings for the planting of old fields or in bare spots in the school forest. Forty schools were able to establish seed beds the first year and a number began planting by the removal of wild seedlings from the forest.

During the school year representatives of the staff of the Georgia Forest Service visited the school forests three times and conducted demonstrations instructing the pupils in tree identification, seed bed construction and operation, planting, thinning, improvement cutting, estimating the volume of standing timber and wood utilization. The students were intensely interested and

did the work assigned to them with enthusiasm and efficiency.

The project was presented to the students by the job method in keeping with the plan used in teaching agricultural subjects in the school. Each job was clearly outlined and certain references given to state and federal bulletins to be studied in preparation for the job. This done the students proceed to the work assisted by representatives of the Georgia Forest Service.

Each school forest has two comparable quarter-acre plots laid off side by side, one to be burned over annually and the other kept free from fire, the object being to demonstrate the effect of fire on tree growth.

Diameter measurements are made at 4½ feet from the ground annually and records are kept in forms provided for the purpose. To facilitate keeping records, each tree on the sample plots is tagged with a numbered metal tag. In addition, tags are placed on any species not represented on the sample plots and annual measurements are recorded for information as to their rate of growth.

The schools are provided with forms for recording all removals so that a complete record of yields may be kept.

More than fifty students began forestry projects the first year, applying what they learned in school and on the school forest to their home forests. For

this work they received a unit of credit in school work just as they receive on soil improvement, crop or livestock projects carried out at their homes.

Among the duties of the students is the construction of fire breaks in and around the forest wherever there are fire hazards. The sample plots are surrounded with fire breaks. Methods of fire fighting are demonstrated and every effort is made to impress the students with the great necessity of preventing fires and suppressing them when they break out.

The Georgia project in forestry calls for a summer camp for those boys doing outstanding work, the inauguration of which is expected in 1931. In this camp it is the plan to give more intensive training in the forestry subjects taught in the rural high schools with the expectation of equipping the students to do timber cruising, fire control work and other non-technical forestry work, for which they will receive a certificate of vocational forester.

The greatest contribution to forestry coming from the work of the 2,360 high school students who engaged in the forestry project in 1929-30, is what they will take to their own farms and put into practice.

C. A. WHITTLE,  
*Director of Education,*  
*Georgia Forest Service.*

## PULP PROSPECTS IN RELATION TO FOREST MANAGEMENT<sup>1</sup>

By D. S. SCRITSMIER

*Puget Sound Pulp and Timber Company, Washington*

More complete utilization of our trees is paramount to an effective forest management program on private land.

When a market is found for our low grade timber and our wastes, many of our forest management problems adjust

<sup>1</sup> Brief of a paper presented at annual meeting, Western Forestry and Conservation Association, March 4, 1930. Portland, Oregon.

themselves. The pulp and paper industry will play an increasingly important rôle in our future forestry program. In the West, pulp manufacture deserves first attention but paper manufacturing deserves study as well. The West has the raw material for the pulp, but it is doubtful if paper manufacture will assume much larger proportions than at present, except as local markets for paper improve. The ideal development of pulp manufacture in the West would be an annual output corresponding to the wastage accompanying the cutting of the virgin forest for sawlogs. In the Douglas fir region there are excellent pulp woods—Sitka spruce, western hemlock, noble and silver fir. Douglas fir is not yet capable of economical conversion into pulp and paper except for cartons, boxes and insulating board. The future of Douglas fir as a general pulp wood depends solely upon the outcome of laboratory researches under way and yet to be taken up. Only a small amount of spruce is available for pulp, because there is a good demand for it as lumber. Of the noble and silver fir and hemlock large amounts are still left in the woods, and more is being left each year, as the more accessible forests are cut and those that remain have higher percentages of species other than Douglas fir. The utilization of the true firs and hemlock for pulp has already made it possible to operate some stands which would not pay were they operated for sawlogs only. Sawmill waste, especially at tidewater mills, has been largely eliminated due to the establishment of pulp mills, and this bene-

fit will naturally be shared by the logging industry. Logging waste is more difficult to eliminate. Machinery is designed for moving heavy logs and is not adapted to handling lighter material economically. Very likely the areas will have to be logged twice—heavy equipment removing the logs and lighter equipment being used for the smaller material destined for pulp.

Our fire problem in the Douglas fir region is a difficult one. As long as we have large untimbered areas where fire protection is limited and from which fires can spread into the forest, and as long as we have such heavy waste remaining after logging, the fire hazard will remain great and reforestation will naturally lag. The utilization of woods waste for pulp will be an important factor in alleviating the fire situation. Lighter slash disposal fires will then cause less destruction of seed and natural reproduction should be more effective.

Closer utilization will make forest management more profitable. Without closer utilization being possible, the interest in forestry will lag. The use of material not desirable for lumber for pulp points the way to forestry. But in addition we must have legislation that will protect our pulp industry against foreign invasion.



#### TIMBER CONSERVATION BOARD PROPOSED TO PRESIDENT HOOVER

A group of lumbermen waited upon President Hoover on April 30, 1930, and presented to him a statement urging



the creation of a Timber Conservation Board to solve the problem of the over-production of lumber. The statement, in full, follows:

TO THE PRESIDENT OF THE UNITED STATES:

*Concerning a Proposed "National Timber Conservation Board"*

At the hearing with the President on forestry appropriations, in October, 1929, the representative of the American Forestry Association (Ex-Governor Robert P. Bass, of New Hampshire), closed his remarks as follows:

"In conclusion, I want to revert to the fundamental needs of this entire situation, namely, a more permanent and stable forest policy based on the actual future requirements of the country definitely ascertained. . . .

"Finally, I believe that public opinion is ripe for a general review of our forest activities for the purpose of meeting present conditions and providing more fully for our future needs."

The forest situation embraces a series of major problems each of which bear directly or indirectly upon the productive use of forest land. The solution of any one of these major problems will be a step forward in the solution of the situation as a whole. One of the most aggravated problems pressing for constructive handling is the almost chronic over-production which has characterized the forest industries for the past decade and a half. This situation appears to be becoming progressively worse instead of better. It is threatening the forest industries with economic chaos. It is contributing to destructive lumbering, unnecessary waste of wood, and the premature cutting of timber needed in the future. It is having a deadening effect upon forest land values and the practice of industrial forestry. It is driving forest land from the tax rolls of many states with serious effect upon local and regional prosperity. It is making for insecurity of employment and is a serious obstacle to sustained land use, fire protection of productive areas, and a permanent supply of raw wood im-

portant to industry and commerce.

Correction of the over-production situation will not solve the whole forest problem, but its constructive handling as promptly as possible is dictated by the public interest in a reasonably prosperous industry upon which the nation must depend for the productive use of 60 per cent or more of its forest land. Solution of the over-production problem should serve to give freer flow to the practice of commercial forestry and to clarify handling of the other major problems involved in the broad forest situation. With public support and cooperation, the disordered state of supply and demand, it is believed, can be largely remedied within a reasonably short time.

To this end, a National Timber Conservation Board, with the aid of the best industrial experts and forest economists it is possible to obtain, is proposed to study the problem and to recommend a remedial course of action based upon public interest. The Board should act solely as a fact-finding agency and to make such recommendations as the findings-of-fact warrant. It should act under public commission, created by presidential appointment and composed of outstanding men representative of the forest industries, the forest conservation movement in its broad aspects, the general public, and the Government. The Board is not proposed with the idea that it can or will attempt to frame a broad national forest policy but rather to direct its activities to the national economic problems involved in the supply and use of forest products and the maintenance of these sources of employment and national wealth.

#### I. OBJECTIVES:

Declaration of facts, and recommendation of policy and action on the following problems of broad public interest:

1. What are the important Assets and Liabilities in the present

Balance Sheet of our forests and forest industries? Points of economic strength, or weakness, in the present forest situation? Wherein is present knowledge adequate or inadequate, as the case may be, for the formulation of sound policies and programs?

2. Basic economic causes of the prevailing condition of over-production of forest products and consequent waste of timber, depletion of forest resources, and insecurity of employment in the forest industries? Possible remedies in terms of public and Governmental policy? Federal and state legislation? Industry action? Present method of annual property taxation of timber and forest lands and its economic consequences as deterrent to conservation or a stimulus to premature and wasteful cutting of timber.

3. The commercial and industrial policy of the United States Government in its capacity as the largest single owner of timber? The use of publicly-owned forests to promote the general practice of "sustained yield" cutting of timber. Sale and use of publicly-owned timber, especially National forests, Indian timber reserves, and State forests in relation to the production control problem? Needs, if any, for additional public forest land acquisition?

## II. FUNCTIONS:

Three functions are proposed, namely:

1. Fact-finding.
2. Report and publication of findings.
3. Recommendations of National Policy.

## III. CONSTITUTION:

We believe a desirable plan reason-

ably commensurate with the public importance of these proposed objectives will warrant the appointment of a Commission or Board, including outstanding men, drawn from the general public, the conservation movement, the forest industries; and representatives of Government—preferably the Secretary of Commerce, the Secretary of Agriculture, and the Secretary of the Interior.

## IV. FACILITIES:

Presumably there will be readily available the facilities of the Department of Agriculture, United States Forest Service; also the facilities of the Department of Commerce, and of the Department of the Interior.

Similarly the facilities of the organized forest industries are available; and undoubtedly those also of forest schools and colleges, certain research foundations, and probably the farm organizations.

Advisory committees appointed by a National Timber Conservation Board, constituted as proposed, will readily command the donated time of the best specialized talent available in the conservation movement, and in the wood-using industries and it is hoped, in the Public Service also.

## V. PERSONNEL:

Probably an executive personnel with staff assistants of from two to four will be desirable. Convenient housing and necessary clerical assistance, no doubt, are readily available at no additional expense.

## VI. COST:

The total direct cost, as estimated, should not exceed \$40,000. Outstanding men would, at the President's invitation, serve more readily on a "dollar a year" commission than they would for any salary which the Government may pay.

## VII. TIME:

Eighteen months.

The President evinced considerable interest in the proposal and raised the question of ways and means for finan-

cing the undertaking. Upon being assured by Mr. Kirby and Mr. Compton that the necessary funds would be raised, he is reported to have stated "You have done your part; I will do mine."

Those who sponsored the proposal and the representatives from interested organizations accompanying them to the President's office included: J. H. Kirby, lumberman, Houston, Texas; E. L. Carpenter, lumberman, Minneapolis, Minnesota; E. G. Griggs, lumberman, Tacoma, Washington, representing also the Western Forestry and Conservation Association; W. M. Ritter, lumberman, Columbus, Ohio; A. J. Peavy, lumber-

Manager, American Paper and Pulp Association; Chester Gray, American Farm Bureau; Franklin Reed, forester, National Lumber Manufacturers Association.



#### NEW YORK REFORESTATION<sup>1</sup>

The progress of reforestation of farm lands submarginal for profitable agriculture in New York State is worthy of further note in the JOURNAL.

The preliminary report of the Reforestation Commission<sup>2</sup> under date of February 6, 1930 set forth a definite program as follows:

Year	Acres to be Acquired	Acres to be Reforested	Appropriation Necessary
1930	40,000	10,000	\$ 400,000
1931	50,000	15,000	600,000
1932	50,000	22,000	1,000,000
1933	60,000	30,000	1,200,000
1934	100,000	40,000	1,400,000
1935	100,000	50,000	1,600,000
1936	100,000	60,000	1,800,000
1937	100,000	70,000	2,000,000
1938	100,000	80,000	2,000,000
1939	100,000	90,000	2,000,000
1940	100,000	100,000	2,000,000
1941	100,000	100,000	2,000,000
1942	-----	100,000	2,000,000
1943	-----	100,000	-----
1944	-----	133,000	-----
	1,000,000	1,000,000	\$20,000,000

man, Shreveport, Louisiana; Wilson Compton, Secretary-Manager, National Lumber Manufacturers Association; Wm. B. Greeley, Secretary-Manager, West Coast Lumbermen's Association; George W. Sisson, Jr., paper and pulp manufacturer, representing also American Forestry Association; Paul G. Redington, President, Society of American Foresters; Jesse H. Neal, General

In order to carry out this program a constitutional amendment was prepared, approved by the Commission and recommended for adoption. With slight modifications this proposed amendment was passed by concurrent resolution of the Assembly. This amendment following the usual legislative course must be passed by the next assembly and approved by the vote of the people before

<sup>1</sup> Reforestation makes progress in New York State, Nelson C. Brown. *Journal of Forestry*. Vol. XXVII:425.

<sup>2</sup> Preliminary report of the Reforestation Commission. State of New York, Legislative Doc. (1930). Albany N. Y.



it may become effective in 1932.

The Reforestation Commission was continued and appropriation of \$280,000 made for the Conservation Department (in addition to \$120,000 in budget, or a total of \$400,000) for reforestation and expenses.

The New York State Conservation Department under date of July 28, 1930 reported progress in a newspaper release as follows:

"Under the program of acquisition of abandoned agricultural lands outside of the Forest Preserve counties initiated by Chapter 195 of the Laws of 1929 and known as the Hewitt Act, the Conservation Department on July 10, 1930, had paid for and had under contract lands in twenty-two areas in ten counties, aggregating 17,653.14 acres, the average price for which is approximately \$3.35 per acre, prices having ranged from \$3.00 to \$4.00.

"At the termination of the planting season this spring, there had been planted on these lands a total of 3,583,090 trees at an average cost per thousand of \$6.32. In addition, the areas planted are now being protected by fire lines consisting of six parallel furrows. These fire lines are being made along all of the highways running through or along the areas in question.

"Payments for lands under this program are made upon the approval of title by the Land and Title Bureau of the Department of Law and on July 10th aggregated 6,940.05 acres and the total outstanding contracts, 10,713.09 acres. The Conservation Department is planning to reforest this fall all of the lands to which title may be approved.

"These reforestation areas are located in the following counties: Two in Broome and one each in Cattaraugus, Chautauqua, Montgomery, Oswego and Schoharie; five each in Chenango and Otsego; three in Cortland and two in

Madison. Additional areas are being acquired as rapidly as tracts larger than the statutory 500 acre minimum are offered."

Since the date of the newspaper release rapid progress has been made in land acquisition. Additional lands purchased bring the total acquired and under contract to 23,972.30 acres, the average price for which is \$3.62, the maximum still being \$4.00. These lands are located in 31 areas of 500 acres or more each in 12 different counties, as follows: Alleghany 1; Broome 2; Cattaraugus 2; Chautauqua 1; Chenango 6; Cortland 3; Madison 2; Montgomery 1; Oswego 2; Otsego 7; Schoharie 3 and Steuben 1.

Approximately 50 per cent of the lands to be acquired in 1930 have already been obtained. The acquisition work was handled largely through five new district foresters who began active work on June 1.

S. N. SPRING.



#### FORESTRY PROGRESS IN INDIANA

The Division of Forestry of the Indiana Department of Conservation is receiving \$100,000 a year for the purchase of lands for state forests. One tract of 8,000 acres purchased in 1929, is within an hour's drive of Indianapolis. On this forest, recreation and timber production will be dual objectives. The State now has 725 private tracts listed under the tax exemption law. This law is believed to be working very satisfactorily. Research projects are steadily being established although the personnel is yet limited.

**SOUTHWESTERN FOREST AND RANGE RE-  
SEARCH CONSOLIDATED HEADQUARTERS  
MOVED TO TUCSON**

Under a recent reorganization, all forest and range research work by the Forest Service in the Southwest has been combined into a single organization designated The Southwestern Forest and Range Experiment Station. Four heretofore more or less independent units, The Southwestern Forest Experiment Station, The Santa Rita Range Reserve, The Jornada Range Reserve, and a special corps of men working on range and watershed problems, are being brought together under a single administration. These branches will continue to function very much as in the past. The headquarters of the new organization will be in the Agricultural Building of the University of Arizona. The Director will be G. A. Pearson, who has been in charge of the Southwestern Forest Experiment Station at Flagstaff, Arizona since its inception in 1908. The removal of the directing staff to Tucson makes possible closer collaboration with the scientific staff of the University and of the Desert Laboratory. Centers of work and personnel of the new organization are as follows:

**STATIONS**

Central office, University of Arizona, Tucson.

Fort Valley Forest Station, near Flagstaff, Arizona.

Santa Rita Experimental Range, near Tucson, Arizona.

Jornada Experimental Range, near Las Cruces, New Mexico.

Other centers of work:  
Roosevelt, Arizona.....Erosion Studies

Cloudcroft, New Mexico

Forest Management

Santa Fe, New Mexico

Forest Management

**PERSONNEL**

Director.....G. A. Pearson

In Charge Forest Research

G. A. Pearson

Hermann Krauch, Associate Silviculturist.

E. M. Hornibrook, Junior Forester.

W. J. Osborn, Superintendent, Fort Valley Station.

In Charge Range and Erosion Research

C. K. Cooperrider

B. A. Hendricks

Associate Range Examiner

H. O. Cassidy

Associate Range Examiner

E. S. Bliss.....Junior Range Examiner

M. J. Culley in charge

Santa Rita Experimental Range

Paul B. Lister

Assistant Forest Ecologist

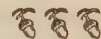
R. S. Campbell in charge

Jornada Experimental Range

R. H. Canfield.....Junior Range Examiner

Clerks: Walter P. Costello and

Margaret Blank



**RESEARCH ACTIVITIES IN INTERMOUNTAIN REGION ARE MERGED**

Increased appropriations in the Agricultural Appropriation Act for the fiscal year 1931 have made possible the merging of the forest, range and erosion research work of the Intermountain Region of the United States Forest Service in a new experiment station to be known as the Intermountain Forest and Range Experiment Station. The new station

with headquarters at Ogden, Utah, will consolidate research on range and erosion problems carried on by the former Great Basin Experiment Station and the studies of the timber-growing in this region provided for by the appropriation. It is expected that the biological investigations of the Bureau of Biological Survey in the region also will be carried on at the new station.

C. L. Forsling, Silviculturist, who has been director of the Great Basin station since 1922, will be the director of the new station. The technical staff of the station now numbers six, and it is expected that several additional workers will be added to do the enlarged range and forest investigational work.



#### FOREST RESEARCH INSTITUTE OPENS AT MONT ALTO

The newly created Forest Research Institute of Pennsylvania's Department of Forests and Waters opened its doors formally on June 5. Close to three hundred people attended the opening. In the morning, addresses were heard from Dr. Earle H. Clapp, United States Forest Service, who spoke on the significance of research; Dr. Joseph S. Illick, who spoke of the plans of the Institute, and others. In the afternoon the party journeyed by automobile over the adjoining State Forests and was shown the many experimental forest operations already underway. These operations, largely sample plots and all well marked, were established over a period of nearly thirty years by the Mont Alto Forest Academy and its successor in connection with their work of instruction. The Institute is quartered in Science Hall,

the main building of the Pennsylvania State Forest School, it is however a separate organization and does no teaching. It was organized to "encourage, promote, and correlate forest studies and demonstrations in Pennsylvania." The Director of the Institute is Willis M. Baker, formerly Associate State Forester of New Jersey. Other members of the research staff are George S. Perry, Henry E. Clepper, and T. Edward Shaw, senior research foresters; John E. Aughanbaugh, research forester; and Chester A. Coover, assistant research forester.



#### DUKE UNIVERSITY LAYS FOUNDATION FOR NEW FORESTRY SCHOOL

With its appointment of Dr. Clarence F. Korstian as Director of Duke Forest and Professor of Silviculture, Duke University has taken an important step toward the establishment of a forestry school. At first, Dr. Korstian will devote his efforts to studying the possibilities of Duke Forest as a unit for the demonstration of forest management and as a school forest. The forest has an area of 5100 acres and adjoins the Duke University campus at Durham, North Carolina. It lies in the lower Piedmont region and consists of second-growth shortleaf and loblolly pines, and hardwoods. Because of the representative nature of this tract, and because of its size and location it is expected to serve well as a research and demonstration forest. A research program will be developed, taking full advantage of opportunities to cooperate with other departments of the University and with other agencies in the region, such as



forest schools, State departments, and the Appalachian Forest Experiment Station of the U. S. Forest Service. Since the plans for the school are now only partially developed, no curriculum has been made up and it is not planned to give any courses during the school year 1930-31. Duke University thus starts by developing its forest laboratory before it opens its classrooms—a unique procedure among American forestry schools.

Dr. Korstian believes that a forest is as essential for the training of a forester as a hospital for that of a physician or surgeon, and the longer a forest has been under management, the more instructive it is to the professional forestry student. In many ways the administration of a school forest by a forestry teacher is a courageous undertaking. He accepts the challenge of proving that his classroom theories stand the test of practicality. The strength of European forestry schools and teachers is pretty much a result of their actual handling of forest properties—from preparing the ground for the seed to the marketing of products.

Duke University inaugurates forestry with another forestry school already in operation in the same state. Being privately endowed, however, and therefore happily independent, it can develop its forestry department without heed of political pressure or prejudice. Duke's opportunities for great strength in the graduate field are large indeed—a well financed University, a progressive state, and a region of superior timber growing energy close to a great market, make a strong combination.

Dr. Korstian is well acquainted with

the forestry situation in North Carolina. Since 1921 he has been a member of the staff of the Appalachian Forest Experiment Station, and resigns this work in the fall of 1930. He graduated from the University of Nebraska in 1911, obtaining a Master of Forestry degree two years later. After two years in timber sales work and two in silvicultural research work at the Fort Valley Experiment Station in the Southwest, came five years of forest research in the Intermountain region; following this he was transferred to the Appalachian Station. In 1926 he earned a Ph.D. degree from Yale through graduate work at the Yale School of Forestry.

EMANUEL FRITZ.



#### SECOND SOUTHWEST SOIL AND WATER CONSERVATION CONGRESS

The second conference on Soil and Water Conservation for the Southwest was held at the Oklahoma A. & M. College at Stillwater on June 19th and 20th. The first conference was held at College Station, Texas, June 20 and 21, 1929, and the proceedings of the conference were published by the A. & M. College of Texas.

At the second conference there was an attendance of over sixty specialists and others interested in the prevention and control of soil erosion and in conservation of water for agricultural purposes. Each of the Southwestern States—Oklahoma, Texas, Missouri, New Mexico, Kansas and Arkansas—had delegates at the meeting who told in detail what their respective states and state experiment stations were doing in connection with the conservation of soil and water.

Representatives of the Bureau of Chemistry and Soils and the Bureau of Public Roads told of the work carried on at the Erosion Experiment Stations which have recently been established under the \$160,000 Congressional appropriation for erosion studies.

Dr. A. G. McCall, Chief of the Bureau of Chemistry and Soils, summarized the work which had been done and spoke on the Soil Conservation Research Program for the Southwest. This program includes a study of erosion control by forest agencies and a sum of \$10,000 has been allotted to the United States Forest Service for erosion studies in the lower Mississippi Valley. In this connection G. H. Lentz presented a report of the work carried on in Mississippi by the Southern Forest Experiment Station.

One of the most interesting papers presented was that of Dr. N. E. Winters in which he told of the results of an erosion survey of Oklahoma. In this survey a crop meter (developed by Mr. McCandliss of the Bureau of Agricultural Economics) was used in tallying the various types of erosion found. This crop meter can be attached to the speedometer of a car and by means of a key board with twelve separate punch keys, twelve separate land types can be tallied. Dr. Winters found 13,000,000 acres, out of a total of 16,000,000 which he surveyed as suffering from one form or another of erosion, and 6,000,000 acres of the 13,000,000 were gullied. This is the first time a crop meter has been used on such work and it opens up further possibilities in its use by foresters for tallying timber areas or burned areas along roads.

With one or two exceptions the tech-

nical papers at the conference dealt entirely with problems directly related to farming practices; methods of terracing, crop rotations to build up the organic material in the soil, and ways and means of measuring run-off and silt loss.

The editor of the Dallas (Texas) *News* in summarizing the high spots of the meeting called the attention of the delegates to the fact that the wider aspects of the whole problem had been ignored. He suggested, for example, that reforestation should be considered "for there are millions of acres of land that should go back to timber," and that the approach to the whole subject should be from a broader angle.

Among the sixty delegates present there were only three foresters—two from the United States Forest Service, and the forester of the Missouri Pacific Railroad.

The Third Soil and Water Conservation Conference will be held at Fayetteville, Arkansas during June 1931. Foresters interested in this subject should make every effort to attend this meeting. It is planned to arrange a program so that the foresters can present their views on this important problem which is certainly a bigger proposition than the building of terraces.

G. H. LENTZ.



#### EUROPEAN SEED CROP

The unusually hard winter of 1928-1929 is still sensibly felt in the development of those seed crops that require two years to mature, according to A. Grünwald, seed collector, Wiener Neustadt, Austria. Many other tree species will produce a reduced seed crop be-

cause of the severe drought of June. Crops from spruce, fir and larch will vary from fair to poor. Of the several species of pines there is expected a sufficient crop to meet the usual demands. The Scotch pine is expected to yield well in the former Austro-Hungarian region and Poland, but in Germany and France it will likely be poor. The variety *rigensis* will produce but a small crop in Finland this year.



#### HUGH P. BAKER RETURNS TO SYRACUSE

Word has been received that Dr. Hugh P. Baker, first Dean of the New York State College of Forestry at Syracuse University and later secretary of the American Paper and Pulp Association and then with United States Chamber of Commerce, has been reappointed Dean to succeed the late Franklin F. Moon. Further details are expected for the November issue.



#### RAMSDELL BECOMES PACK PROFESSOR AT MICHIGAN

Announcement is made of the appointment of W. F. Ramsdell to the recently created George Willis Pack professorship of forest land management in the School of Forestry and Conservation, University of Michigan. Mr. Ramsdell resigns from the United States Forest Service where he was assistant regional forester in the Lake States Region. This professorship, maintained with part of the income from a foundation established by Charles Lathrop Pack in memory of his father, has as its purpose the promotion of practical forest land management through woods work, rather than

class-room instruction. Mr. Ramsdell received the B. S. and M. F. degrees from the University of Michigan in 1912 and 1914, respectively. He entered the Forest Service as a student assistant, and had served on seven different national forests in the West when in 1924 he was made inspector in forest management in the North Pacific region. He was assigned to the Lake States regional office when it was first organized in May, 1929.



#### LAMB LEAVES WALNUT ASSOCIATION

George N. Lamb, a senior member of the Society, has resigned as secretary of the American Walnut Manufacturers' Association. Mr. Lamb's resignation came as a result of his assumption of greater duties with the Flexwood Company of which he is a director and is now to be its treasurer and sales manager. The Company manufactures a flexible veneer. Under Mr. Lamb's direction the Association has become one of the most successful lumber trade associations. One of his projects was the encouragement of the planting of walnut on farms and in woodlots. He is succeeded by C. Burdett Green, a graduate of the Yale Forest School and formerly with the U. S. Forest Service.



#### CRONEMILLER APPOINTED STATE FORESTER OF OREGON

Lynn F. Cronemiller has been selected to succeed the late F. A. Elliott as State Forester of Oregon. Theodore Rainwater, of the Coos County Fire Patrol Association, has been chosen to succeed Mr. Cronemiller as deputy State Forester.



### SOUTHWESTERN REGION HOLDS FIRST FORMAL TRAINING CAMP FOR TIMBER SALE MEN

The first training camp for timber sale men in the Southwestern Region of the United States Forest Service was held at Fort Valley, near Flagstaff, Arizona, from July 28th to August 9th, inclusive.

The 13 men attending were staff men handling timber sales on the Coconino, Tusayan, Sitgreaves and Lincoln National Forests; the men in charge of the project sales in the Region and some of the sales assistants who could be spared from their jobs for several weeks because of the slowing down of sales operations due to the recent market depression.

The purposes of the camp were:

1. To go over with the men the finer points of timber sale procedure and to see that they are in agreement to the end that sales in the Region may be uniformly handled.

2. To familiarize them with recent developments at the Southwestern Forest Experiment Station and give them the benefit of contact with the research men in forest and range management.

3. To give the sales men a clearer conception of general administrative problems and to make them feel a real part in the Regional organization.

4. To promote *esprit de corps* among the sales men themselves.

The camp is felt to have been very successful. Under the squad system, the established practice at Southwestern Region camps, the men were divided into three squads. The principal instructors were the Chief of Forest Management and the Logging Engineer who lectured on and demonstrated in the field timber marking, scaling, tree measurement, proper utilization, and the method of making reproduction surveys. Contract conditions and general sale administration were covered and areas on the Coconino and Tusayan National Forests, both cut over under Forest Service and private policies, were examined. Approximately 30 per cent of the time was spent in indoor lecture work and 70 per cent was spent in the field. Fire and ranger work-plans were discussed by a man from the Office of Operations, and the men heard also the regional game specialist tell of deer and antelope damage to the local forest range.

The most gratifying feature of the camp was the surprising uniformity of sales practice that already existed among men handling sales. It is felt that the administration of different project sales has been strikingly consistent in the past and will be even more so in the future as a result of this year's training.

STANLEY F. WILSON,  
*Regional Forest Inspector.*



## SOCIETY AFFAIRS



### NOTES FROM THE EXECUTIVE SECRETARY

Section meetings in Connecticut, Pennsylvania, and Florida have given the Executive Secretary an opportunity to enlarge his acquaintance in the Society and to discuss the initial steps in setting up the work for the new office. A news letter prepared at the request of the Council has been sent to the Section Secretaries as one of the first efforts to develop coördination and keep the members posted on matters of general interest to the Society. It is planned to send such a letter at least monthly.

### EMPLOYMENT SERVICE

Of particular interest has been the matter of developing an employment service. The plan is progressing. At the moment a detailed questionnaire, to be used as a basis of the service is in the hands of a number of members who have been asked to criticize it. Revision will be made in the light of the criticism and the forms will then be ready for mailing to individual members.

The questionnaire properly filled out will enable the Society to perform many useful services. Younger members will probably be seeking new experience or better opportunities from time to time. Over a long period of years even older members may consider a change in employment. The data on the questionnaire will help in other ways; for example, committee assignments, selection

of speakers at the annual meetings, or when the Society is called on for a representative, expert testimony at legislative and other hearings, assistance to foreign visitors, and so on. The forms should be a compendium of the training, interests and accomplishments of the members of the profession of Forestry and as such will have far reaching value.

The records will be kept confidential, available only to the staff of the Society's office. Efforts will be made to establish the confidence of employers of foresters in this service.

### MEMBERSHIP

Progress is being made in the effort to bring into the Society those foresters who are eligible for membership. Cards bearing the names of all foresters who are forest school graduates or who are employees of the United States Forest Service, Indian Forest Service, and State services are in the hands of the heads of the several schools or the Chiefs of the Service interested for a final consideration. A fairly complete list of men who are probably eligible for election will be sent to each Section in the near future.

### ADVERTISING

The Executive Secretary has been busy with a campaign to inform possible advertisers of the service that the JOURNAL has to offer. The results so far

indicate sound possibilities. It will require time to make much of a showing.

#### ANNUAL MEETING

Plans for the Annual Meeting are progressing. The program provides for a three-day session at the Wardman Park Hotel, Washington, D. C. Among the speakers it is hoped to have are: Hon. Gifford Pinchot, Colonel W. B. Greeley, Dr. John C. Merriam, and Secretary of Interior Ray Lyman Wilbur. The discussion will include private forestry, the public land policy of the United States, and the field of the profession of Forestry. A series of technical papers will bring out the latest developments in utilization of forest products, control of erosion, seed storage and germination, planting forest trees by machinery and several phases of forest protection. There will be ample time for discussion from the floor.

The railroads have granted special concessions on the certificate plan. A reduction of one-half fare will be allowed on the railroad ticket from Washington to the starting point, provided that one hundred and fifty have come by rail and have obtained the proper certificate at the time of purchasing the ticket to Washington.

Splendid accommodations at very low figures are offered at the headquarters hotel, the Wardman Park. Rates for rooms with two persons, twin beds, excellent outside rooms, three dollars per person. Single rooms, four dollars each. A special feature of this year's meeting will be a birthday party and dinner-dance on the evening of December 29th.

#### NATIONAL TIMBER CONSERVATION COMMISSION

Recommendations for the National Timber Conservation Commission, which President Hoover has decided to appoint, have been made by the American Forestry Association and the National Lumbermen Manufacturers' Association. The Committee will no doubt be announced shortly.

#### FORESTS AND FLOOD CONTROL

President Redington, in continuing his efforts to secure recognition of the service of the profession of Forestry in the great problem of flood control, recently had a conference with Mr. Wallace, Executive Secretary of American Engineering Council, and Mr. O. M. Butler, Executive Secretary of the American Forestry Association. Mr. Redington discussed the visit of the Senate Committee on Wild Life Resources to the Upper Mississippi River Wild Life and Fish Refuge, and of the testimony presented to this committee by Army engineers who are planning the development of the nine-foot channel and the construction of dams to stabilize water levels in the upper reaches of this river; the testimony of biologists and fish culturists as to the effect of raising water levels on these respective resources, and the testimony by Mr. C. G. Bates, of the Forest Service, as to the erosion problems which may be found in that general region.

Mr. Wallace agreed with Mr. Redington's conclusion that some move should be started to check erosion at its source and said that the Engineering Council would be more than glad to join with



others in asking for an appropriation for this purpose. Mr. Redington gave Mr. Wallace a copy of a presentation of the foresters viewpoint made by Messrs. Show and Kotok to the Hoover-Young Water Resources Commission in California and asked him for his comments on it. Mr. Redington felt sure that foresters will receive considerable help from Mr. Wallace's interest in this important national matter.

#### COMMITTEES

In an effort to maintain the best possible relations between the public and the profession of Forestry a Committee on Public relations has been created by President Redington after some little correspondence with Council members. The work of the Committee will be to be on the alert for attacks on the profession of Forestry and to take such action as may be considered advisable. Colonel John D. Guthrie will head the Committee, which will be made up of the several Council members. Attacks that seem to warrant an answer from the Society should be brought to Mr. Guthrie's attention.

#### NEW QUARTERS AGAIN

The Bureau of Vocational Training of the Veterans Bureau of the United States Government leased the entire Lenox Building at 1523 L St., N. W., and the Society was obliged to seek new quarters during the month of August. The new offices at Suite 810 in the Hill Building, 839 17th St., N. W., are somewhat more attractive and convenient than the former location in the Lenox Building. The services of the staff are at the disposal

of the members when they come to Washington. It is hoped that the members will drop in for the mutual advantage it will mean for the Society and themselves.

W. R. HINE,  
*Executive Secretary.*



#### AN EDITORIAL EXPERIMENT

With this issue is begun a plan of preceding each major article with a brief comment by the editor. In one case the comment may take the form of a biographical note, at another time the editor will attempt to direct attention to what appears to him to be the author's outstanding ideas, or he may lay emphasis on the importance of the subject in general.

Frankly, this plan is an experiment. In adding the comments the editor has a single purpose in mind—making the JOURNAL OF FORESTRY more useful to its readers. He expects to do this by saving time for the busy man who is not directly engaged in the field of the author's article but who still would like to know in general the subject matter. He expects also by this means to develop a broader interest in the many ramifications of forestry. Perhaps in some cases the comment will whet the reader's interest to read an article which he otherwise would pass by.

The editor would appreciate criticism for and against the plan, or suggestions for achieving the desired results in a better manner.

EMANUEL FRITZ.

WISCONSIN SECTION EXPRESSES SENTIMENT ON A "FOREST POLICY FOR THE UNITED STATES"

The Secretary of the Wisconsin Section has forwarded to President Redington the following report:

The Wisconsin Section favors efforts on the part of the Society of American Foresters to crystallize a national forestry program and policy. The Section believes that the greatest benefits from such efforts will accrue as the Society is able first of all to arrive at principles to which the public, the timberland owners, and foresters can agree as fundamental and concerning which professional foresters would be recognized as better qualified to speak than other agencies; that an opportunity will be missed if the Society's statement of policy does not attempt to include the fundamentals that all interested elements of the nation can get behind. The Society should stand as spokesman of expert opinion on forestry. The Section believes that the least benefits, if not the greatest harm, from such efforts will accrue as the Society commits itself to measures or ways and means that have not as yet been sufficiently considered or on which the recommendations of economists, business men, and students of national politics should and do have more weight in molding a public policy than those of foresters. In brief, the Section points out that that which the professional foresters only can contribute may easily be sacrificed by being intermixed with nonexpert pronouncements. Hastily considered remedial measures besides jeopardizing the prestige and soundness of technical forestry

opinion may easily react to delay the very ends that are aimed at by providing the means of accomplishing things which are the reverse of those contemplated by the foresters. There is striking evidence that this is already taking place.

The Section believes that the majority report comes closer to containing a proper program and policy for the Society to sponsor than either the proposed modifications accompanying it or the minority report. The Section is of the opinion, however, that even after Recommendation No. 8 is struck out and after modifications are made with respect to Nos. 1, 2, 3, 6, 7, and 12, as are discussed in some detail below, the report leaves much to be desired. The Section believes that greater effort should be made to distinguish between those points that pertain to (a) what the program aims to accomplish, (b) what the program is, and (c) ways and means of putting the program into effect. As the majority report now stands and even as it would stand with those specific modifications that this Section suggests below, Points (a) and (b) above are largely neglected, and the bulk of the emphasis falls on Point (c).

In an adequate program, in our opinion, (the term "program" is better than policy because it is more inclusive) prior attention should be given to setting up an estimate that is as close as present information permits as to the quantity, character, and location of the forests that are needed for commodity purposes and for the other purposes that forests serve. In attempting to crystallize public opinion to the point of action it is not enough to say that we

are in desperate need of forests on all available forest lands.

Certainly no better platform can be built on which to base our public appeals than a deliberate appraisal of our needs. This does not mean delays and further inaction. Preliminary estimates will suffice but they must aim at being specific rather than general and matter of fact rather than partially emotional. Until real effort is made to appraise in this way the nation's needs for forests there is little likelihood of bringing about the necessary public action, or of making sound decisions as to what the acquisition program for publicly owned forests should be or what in excess of our needs in publicly owned forests must be supplied under private ownership.

It is desirable that accurate figures be obtained as soon as possible, but there is no need to wait for the results from such time-consuming work. This point is dealt with in the recommendations of the majority committee but with no such emphasis as to suggest the utmost priority. Of equal priority and truly a point of policy is putting a stop to forest fires. This, too, is included in the recommendations of the majority report but with insufficient emphasis.

The Section has taken no action to date relative to other points that should be given a different kind of emphasis in a reconstructed program and as a general proposition believes that the more vital additions are dependent upon the preliminary estimates of quantitative and qualitative requirements for forests.

The foregoing covers the Section's general attitude toward the main objec-

tives of the Forest Policy report. To further explain its position, specific comments on the thirteen points of the majority report are given below:

*1. Program for the Acquisition of Forest Lands by the Federal Government.*—The Section concurs with the principles involved in this recommendation and points to the necessity of as carefully estimating the requirements for other purposes as has been done for watershed protection. Account must also be taken on the effect of greatly increased production from publicly owned forests on the profitableness of private forestry.

*2. The Development of a Workable Plan for Stabilizing the Lumber Industry, Particularly on the Pacific Coast.*—The Wisconsin Section is in hearty accord with a plan of stabilization for the lumber industry if such a plan provides for orderly marketing, satisfactory utilization, a price sufficiently high to allow a reasonable profit, proper distribution of cut, and adequate provision for regrowth of the stand and fire protection. Without such a guarantee stabilization which means only greater profits might defeat the very end sought. For example, it is pointed out that curtailed production in the northwest without commensurate restrictions in the East and South would merely stimulate the cutting of even smaller trees in these regions. It seems quite certain that keen competition from the northwest has actually reduced the destruction of the forests of the East and South. In this connection, attention is called to the fact that it is much more important to protect second growth from fire and premature cutting than to curtail the pro-



duction of lumber from mature and often decadent stands.

Controlled production, if it means operating below normal capacity, is inefficient and will be of no value unless it raises lumber prices without a corresponding increase in production costs. Even if such is the case it is only a temporary remedy and there is no assurance that more forestry will be practiced because of better conditions in the industry. The lack of forestry is not the cause of the present depression in the lumber industry, but the absence of forest practice is one of the things that makes the solution of the present problem more difficult.

The Wisconsin Section questions the advisability of the Society stating unequivocally that the Sherman anti-trust law should be amended. This is a legal and economic question on which foresters are not fully qualified to pass judgment. Would it not be better to delete this statement and perhaps save embarrassment later on, should an authoritative study show that such a plan would be unwise? As a general principle, the Section feels that the Society's recommendations are going to carry weight only so long as it sticks to the things on which it can be expected to speak authoritatively.

3. *Acceleration of the Coöperative and Research Activities Already Provided for Under the Clarke-McNary and McSweeney-McNary Acts.*—The Section concurs with this recommendation, although not to the extent of limiting action relative to control of forest fires to coöperative effort between public and private agencies. The Section considers that it may be necessary to adopt

promptly measures which put fire control on a uniform nation-wide basis and its administration under federal control.

4. *Strengthening of National Forest Administration, Protection, and Improvements.*—The Section concurs with this recommendation.

5. *Definition of Status of Indian Forest Lands.*—The Section concurs with this recommendation.

6. *Retention of the Forest Service in the Department of Agriculture.*—The Section concurs with the facts entering into this recommendation; at the same time it is of the opinion that broadly speaking this is a matter of administration and for that reason should not be included with questions applying specifically to the fundamental principles surrounding the forest policy question.

7. *A Study of Future Timber Supplies and Land Utilization.*—The Section agrees to the necessity of this study, but desires to urge that it be given much higher priority than evidently intended by the committee that drew up the majority report. As in Recommendation No. 6 the details of how or by whom the study is made are matters of administration and out of place in a statement of program.

8. *Establishment of a Permanent Central Forestry Board.*—The Section does not believe that the establishment of a permanent Central Forestry Board would be good policy. The U. S. Forest Service by virtue of the experience and training of its men and the prestige it carries as a Department of the Government is in a much better position to assume the rôle of leadership than such a board would be, at least for a long time. The Forest Service must go on to

administer the National Forests, and the creation of such an additional agency in the forestry field might result in divided leadership and responsibility which at the outset probably would be undesirable.

*9. Fulfillment by the States of Their Responsibility for the Vast Areas of Forest Lands not Included Under the Federal Acquisition Plan, with the Assistance Afforded by the Clarke-McNary Act.*—The Section concurs with this recommendation.

*10. Fulfillment by Private Owners of Their Responsibility in Protecting Their Lands and Exploiting Them Without Destroying the Growing Capacity of the Forest.*—The Section concurs with this recommendation.

*11. A Study of Public Regulation.*—The Section concurs with this recommendation.

*12. Introduction of Better Methods of Utilizing Timber.*—The Section concurs with this recommendation, but desires to point out that improvement in utilization must keep pace with the general trend in industry where scientific principles are being applied. The utilization of the past is not good enough to meet satisfactorily the demands of present or future economic requirements. To survive, forest industries will be compelled to adopt better utilization methods and cutting practices which will insure a permanent supply of timber to them.

*13. Adequate Support of Public Education in Forestry.*—The Section concurs with this recommendation.

## ANNUAL SUMMER MEETING OF THE NEW ENGLAND SECTION

The annual summer meeting of the New England Section was held at Hartford and New Haven, Connecticut, on July 14 and 15, 1930, with fifty-five members in attendance. Chairman A. F. Hawes, State Forester of Connecticut, together with W. O. Filley, Forester for the Connecticut Agricultural Experiment Station at New Haven, and Prof. R. C. Hawley, member of the faculty of the Yale School of Forestry and director of the Eli Whitney Forest, arranged the details of a most interesting program of field excursions to some of Connecticut's leading forests.

The meeting was officially opened by a visit to the Connecticut Agricultural Experiment Station's Rainbow Plantations some ten miles north of Hartford. These afforded an opportunity to see a great variety of both pure and mixed coniferous stands in which such operations as pruning and thinning had been carried out. Especially noteworthy was the comparatively small amount of weeviling in white pine. The straight boles were in striking contrast to the weeviled "scrubs" so common in pure pine plantations in many other sections of New England. Likewise other species such as red and Scotch pine showed highly satisfactory growth and form on a soil which was described as a coarse sand containing less than 10 per cent of silt and clay. Following the inspection of the plantations luncheon was provided by the Connecticut Agricultural Experiment Station.

In the afternoon State Forester Hawes conducted the party through the Meshomasic State Forest in the Town of Port-

land, where various treatments including planting, weeding, pruning, and thinning has been applied. Of special interest to many were the promising, middle-aged stands of mixed hardwoods containing tulip poplar, ash, oak and other desirable hardwoods. Demonstrations of the use of forest fire pumps and forest road making machinery were added features. Between events refreshments were served at a log cabin in the forest. Leaving the Meshomasic Forest the party motored to its New Haven headquarters, the Garde Hotel, stopping en route to look at plantations of the Middletown Water Board and other points of interest.

After a banquet at the Garde Hotel an evening meeting was held at the Yale School of Forestry. Those present were pleased to hear from Dean Henry S. Graves who spoke briefly on the Forest Education Inquiry, Prof. R. C. Hawley, W. R. Hine, Executive Secretary of the Society, Prof. H. H. Chapman, the chairmen of the several Section committees, and others. The meeting was most appropriately closed with a showing of motion pictures, taken on the State Forests of Vermont, and the serving of light refreshments.

In the morning and afternoon of the second day's meeting Prof. Hawley and his assistant, William Maughn, conducted an excursion through the Maltby and Saltonstall Divisions of the Eli Whitney Forest at New Haven. While a great variety of conditions and treatments were exhibited on all sides, including both planted and "natural" stands, pruning, thinning, reproduction cuttings, and the like, the featuring of the even-aged form of stand on the Maltby Division in the

morning and the uneven-aged form on the Saltonstall Division in the afternoon served to divide the excursion into two contrasting parts of unusual interest and instructiveness.

At the conclusion of the visit to the Eli Whitney Forest the program called for a trip to Hammonasset State Park on Long Island Sound. This is the largest state-owned park in New England, and is noted for its excellent beach. Following an inspection of the Park by automobile many seized the opportunity to don a bathing suit and take a dip in the saltwater. The fine, sunny weather, the attractions of the beach, and an appetizing clam chowder supper combined to make the visit to Hammonasset most pleasant and memorable. In the evening a final business meeting was held in the Park Pavilion. Prof. H. H. Chapman briefly surveyed the statement of national forest policy submitted to the Sections by the Society's Committee on Forest Policy, and stated that it would be re-drafted so as to be acceptable to New England. The meeting was adjourned that the beauties of the evening might be enjoyed on the beach, but even the wonders of Nature encountered a strong rival in the person of Mr. Ed. Frouchee, author of the famous French Canuck stories and a most delightful entertainer.

During the course of the meeting A. W. Hurford extended an invitation to the Section to come to Providence, R. I., for its annual winter meeting. This invitation was particularly welcome inasmuch as the Section had never held a meeting in that state.

A. C. CLINE,  
*Secretary.*



### APPALACHIAN SECTION PASSES FOREST POLICY RESOLUTIONS

The Appalachian Section of the Society of American Foresters at its meeting on February 26 and 27, 1930, at Bristol, Tennessee, passed the following resolutions:

WHEREAS, the present economic status of private ownership of timberland in the Southern Appalachians mitigates against desirable forest conservation, and

WHEREAS, we believe that the future growing capacity of this region justifies forestry practice, and

WHEREAS, present economic conditions discourage private investment in forestry practices, therefore  
BE IT RESOLVED:

That the Appalachian Section of the Society of American Foresters goes on record

1. As favoring reasonable public ownership for the purposes of conservation of lands which are now submarginal for the practice of forestry.

2. As believing that future profits will justify private owners to retain all such lands as on which the silvicultural practice may be carried through income from secondary uses.

3. As insisting that there must be an adjustment of taxes compatible with the returns of forest investments.



### REPORT OF THE APPALACHIAN SECTION'S COMMITTEE ON FOREST TYPE CLASSIFICATION

At last year's meeting the Committee reported that tenders had been sent out by the Section to other eastern Sections

of the Society relative to the preparation of a single uniform classification of forest types in the eastern United States. This suggestion was approved by nearly all the Sections and by the President of the Society.

In September, 1929, President Redington acted on the Appalachian Section's proposal by appointing a forest type committee headed by R. C. Hawley of the Yale School of Forestry and made up of a representative of each of the nine eastern Sections.

Professor Hawley has shown a keen interest in the work from the start and has circularized the committee with a preliminary letter and two memoranda aimed to get decisions upon the basis of classification. Professor Hawley quite properly asks that the committee take time to form its conclusions carefully, and expresses the belief that it will take more likely two years than one to arrive at satisfactory final results. One reason for this is that some of the Sections, such as the Allegheny, Ohio Valley, and possibly the Southeastern and Gulf States Sections, have not yet adopted type classifications. Plenty of time, according to Hawley, should be given these and other Sections who may desire to work further in building up suitable local type classifications before final correlation of all forest types is attempted.

Professor Hawley says further, "Our function is conceived to be not only the correlation of types already commonly accepted, but decision as to all type names and as to recognition of suggested types. While the type classifications of the various Sections and of the United States Forest Service should be our starting point and will probably furnish the

bulk of the types finally accepted, yet members should consider suggesting new types which are not on present lists."

The committee has apparently reached the following agreements:

(1) The classification should be for the *cover types*.

(2) It should be on a *taxonomic basis*, but for the purposes of clear presentation and convenient arrangement the cover types can advantageously be grouped according to, first, regional and, second, physiographic divisions.

(3) The *regions* shown in the U. S. Forest Service map, "Forest Regions of the United States" (1924), should be used. These regions are four in number: *northern forest*, *central hardwood forest*, *southern forest*, and *tropical forest*. These regions will furnish the major headings under which all the cover types will be distributed. Subdivisions of these regions are to be considered.

(4) *Physiographic subdivisions*. No agreement yet reached.

(5) There should be a grouping of the cover types into *coniferous*, *coniferous-hardwood*, and *hardwood types*. (Suggested by Hawley that this grouping be used tentatively at first and that it may not serve any useful purpose. The Appalachian Section Committee unanimously opposes any final segregation under these heads.)

(6) *Climax and temporary types*. No final agreement yet reached.

(7) *Nomenclature*. The central committee feels that site should not appear in a cover type name except in rare instances where because of a multiplicity of species its use may be forced. When site is used in a type name it should precede the species designation. Generic

names should be avoided but may occasionally have to be used. Sentiment is divided on naming the type after the key species or the predominating species. Hawley believes we may have to use both methods—predominating species in most cases, in others the key species, and rarely as a last resort falling back on a general name, like "northern hardwoods."

(8) *Minimum area accepted in division*. Not yet agreed upon. Two ideas are put forward by Hawley:

(a) There must be enough cover types recognized so that every piece of forest falls either into one of these types or else into a transition between two types.

(b) To merit recognition a given form of forest composition must be of characteristic occurrence over a considerable area. Hawley suggests that 1,000,000 acres be the minimum limit, allowing exceptions in the case of highly distinctive forms of small total acreage.

(9) *Transitions*. The central committee appears to oppose listing transitions, and Hawley suggests mentioning important transitions in the type descriptions.

At this stage the most important thing to be settled is the physiographic basis for subdivision of the major regional headings. Obviously the physiographic subdivisions should be uniform throughout the regional divisions and their names should be uniform throughout the region where they occur. Hawley suggests the following: dry upland, moist upland, lowland, stream bottom, swamp. "Lowland" is put in to provide for types like slash pine growing on wet

land but not on bottomland. Typical loblolly pine site, also, might come into this class. The Appalachian Section committee is in general agreement with this. One member suggests, in addition, a "litoral" group to take care of certain types along the coast. It will of course be desirable to keep the number of physiographic types down to a small number consistent with general simplicity of the entire scheme. Compromises may have to be made to accomplish this, although any well-marked physiographic area that is fairly wide-spread and important within the territory of only one Section ought to be recognized.

The Society committee has not yet got to the point of considering specific types. However, the following arrangement of the types already recognized by the Appalachian Section shows how they would look if grouped according to the five physiographic divisions suggested by Hawley:

#### NORTHERN FOREST

##### *Moist upland*

Spruce-fir type.  
Hemlock-yellow birch type.  
Northern hardwood type.

#### CENTRAL HARDWOOD FOREST

##### *Moist upland*

Buckeye-basswood type.  
Red oak type.  
Cove hardwood type.  
Yellow poplar type.  
Cove hemlock type.  
White pine type.  
White oak type.

##### *Dry upland*

Pitch pine-mountain pine type.

Shortleaf pine type.  
Virginia pine type.  
Red cedar type.  
Chestnut oak type.  
Black oak-scarlet oak type.  
Post oak type.

##### *Stream bottom*

Riveredge hardwood type.

#### SOUTHERN FOREST

##### *Dry upland*

Longleaf pine type.  
Live oak type.

##### *Stream bottom*

Bottomland hardwood type.

##### *Lowland*

Loblolly pine type.

##### *Swamp*

Swamp hardwood type.  
Southern white cedar type.  
Pond pine type.

No final decision as to our forest types is of course possible at this stage. The whole matter is up in the air pending the suggestions to the central committee from all the other Sections. Some compromises will have to be made if there is ever to be an agreement; perhaps the above arrangement already involves too much of a concession on our part. It discards, for example, the distinction we have made between mountain and plateau types. A study of these types, however, may show that the omission of this distinction is an improvement rather than the reverse.

During the year we may look forward to considerable progress in the general eastern type classification. The Appalachian committee should have the help of all members of the Section. It is hoped that the Section will discuss the



steps so far taken and pass upon them at this meeting. When it comes to deciding upon the forest types we want to have represented, the Section as a whole should take part.

J. W. McNAIR,  
F. H. CLARIDGE,  
E. H. FROTHINGHAM.



CUMULATED INDEX IN PRINTER'S HANDS  
SIZE OF EDITION AND PRICE DEPEND ON  
ORDERS

The Cumulated Index just completed by a committee of the Appalachian Section of the Society of American Foresters is indeed a boon to busy foresters. The full wealth of twenty-seven volumes covering the writings of professional foresters during 27 years is now readily found in a single alphabetical index. Every article in the FORESTRY QUARTERLY, in the PROCEEDINGS of the Society of American Foresters, and in the JOURNAL OF FORESTRY through Volume 27 published in 1929 may be located on reference to one index. Each article is commonly indexed under two or more subject headings to facilitate ready reference. This was an important and very useful undertaking. It required three years of painstaking work for which the Appalachian Section deserves the thanks of the Society.

The committee composed of C. F. Korstian, Chairman, Jesse H. Buell, and Verne Rhoades was formed in January, 1927. It has been steadily at work since that time. It has, moreover, enlisted the aid of many of the other members of the Section and a few friends so that the Cumulated Index represents the effort of virtually the entire Section. It is

a contribution worthy of any section.

It is expected that the Cumulated Index will be of greatest use to libraries, research institutions, and students generally. Requests, however, are already coming in from consulting foresters, state foresters, extension foresters, and not a few individuals as well. It will assure a saving in time for any who have more than casual reference to the files of the JOURNAL.

The Cumulated Index is being published by the Monumental Printing Company of Baltimore for the Society of American Foresters. Present indications are that it will sell for \$1.00 per copy. Orders should be placed at once since the demand will govern the size of the edition and influence the final price.

W. R. HINE,  
*Executive Secretary.*

## FORTHCOMING EVENTS

### ANNUAL MEETING

Society of American Foresters  
December 29-30-31, 1930  
Wardman Park Hotel, Wash., D.C.

Third Southwestern Soil & Water  
Conservation Conference  
Fayetteville, Ark., June, 1931.

Association of State Foresters,  
October 4, 1930, Portland, Ore.

### Section Meetings

Ohio Valley, Chillicothe, Ohio, Oc-  
tober 24-25, 1930.

## ELECTIONS TO MEMBERSHIP

The following men have been recently elected to the grade of membership indicated:

## ALLEGHENY SECTION

*Junior Membership*

Guyer, James R.

Ziegler, R. M.

*Senior Membership*

Burleigh, Thomas D.

Curry, John R.

McIntyre, Arthur C.

## APPALACHIAN SECTION

*Junior Membership*

Beichler, Samuel D.

Grimes, Frank L.

Haynes, Russel E.

## CALIFORNIA SECTION

*Junior Membership*

Baum, Clayton C.

Been, Frank T.

Buell, Crawford.

Coupe, Walter H.

Edler, Arthur C.

Foster, Ellery

Howell, Joseph

Jones, Robert E.

Kingsley, C. E.

Parker, Kenneth W.

St. John, Raymond B.

Smith, Everett

Struble, Geo. R.

Swift, Lloyd W.

Wood, Waldo E.

*Senior Membership*

Cronemiller Fred P.

Durbin, William G.

Hall, Ansel F.

Hughes, Bennett O.

Malmsten, H. E.

Person, Hubert L.

Pitchlynn, Paul P.

## GULF STATES SECTION

*Junior Membership*

Dexter, A. K.

*Associate Membership*

Dormon, Miss Caroline

## MINNESOTA SECTION

*Senior Membership*

Averell, James L.

Paine, F. Rodney

Rees, Louis W.

## NEW YORK SECTION

*Junior Membership*

Brown, Oswald W.

Huppuch, Matthias C.

## SOUTHWESTERN SECTION

*Junior Membership*

Campbell, Robert S.

Monighan, F. J.

## ASSOCIATE MEMBERSHIP

Taylor, Walter P.

## ANNOUNCEMENT OF CANDIDATES FOR MEMBERSHIP

The following names of candidates for membership are referred to Junior Members, Senior Members, and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the May JOURNAL, without question as to eligibility; the names have not been passed upon by the Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before November 1, 1930. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered by the Council as strictly confidential.

## FOR ELECTION TO GRADE OF JUNIOR MEMBER

<i>Name and Education</i>	<i>Title and Address</i>	<i>Proposed by</i>
Bennett, John H. Yale, B. S., 1928; M. F., 1930.	Staff of Charleston Museum, Charleston, South Carolina.	Southeastern Sec.
Bower, Ray F. Mich. State, B. S. F., 1929.	Assistant Forester, Ohio Agric. Exp. Sta., Wooster, Ohio.	Ohio Valley Sec.
Chapman, A. Dale Univ. of Minn., B. S. F.	Taking graduate work at Univ. of Wisc., Madison, Wisconsin.	Wisconsin Sec.
Diller, Jesse D. Bluffton College, A. B., 1924; Ohio State, M. A., 1926; Yale, M. F., 1930.	Inspector, Chestnut Disease, Bu- reau of Plant Industry, Phila- delphia, Pa.	New England Sec.
Garstka, Walter Urban Pa. State, B. S. F., 1929; Yale, M. F., 1930.	Technical Field Assistant, North- eastern For. Exp. Sta., Amherst, Mass.	New England Sec.
Genth, Gustav W. College of Forestry, Tharandt, Germany, 1927.	Field Assistant, Northeastern For. Exp. Sta., Amherst, Mass.	New England Sec.
Hoffman, Jacob M. Biltmore Forestry School, 1913.	Chief of the Bureau of Parks, Dept. of Forests and Waters, Har- risburg, Pa.	Allegheny Sec.
Lambert, John H., Jr. Univ of Me.; Yale School of Forestry.	Forester with Hollingsworth & Whitney Company, Waterville, Maine.	New England Sec.
Lathrop, Clayton Huntington Windham High School.	Assistant State Forest Fire War- den, Lebanon, Conn.	New England Sec.
Mausteller, John Ellis Pa. State, B. S., 1930.	Assistant Forester, Dept of Con- servation & Development, Tren- ton, N. J.	Allegheny Sec.
Miller, William Dykstra Reed College, B. A., 1923; Yale, M. F., 1930.	Student for Ph.D. Yale Forest School, New Haven, Conn.	New England Sec.
Pfeiffer, William H. Pa. State Forest School, B. S. F., 1928.	Administrative charge of finances and operations of Pa. State For- est School, Mont Alto, Pa.	Allegheny Sec.



<i>Name and Education</i>	<i>Title and Address</i>	<i>Proposed by</i>
Rawson, Lovell Cook Univ. of Me., B. S. F.	Forest and Type Surveyor, Ux- bridge, Mass.	New England Sec.
Siggers, Paul V. Univ. of Mich., B. S., 1912; M. S., 1915.	Associate Pathologist, Bureau Plant Industry, Southern Forest Exp. Sta., New Orleans, La.	Gulf State Sec.
Trunser, Joseph J. N. Y. State, B. S. F., 1929.	Assistant Civil Engineer, Dept. of Conservation and Development, Berlin, N. J.	Allegheny Sec.
Unger, Ralph G. N. Y. State, B. Sc., 1930.	Associate Forester, St. Lawrence Univ., Malone, New York.	New York Sec.
Williams, Thomas C. Pa. State Forest School, B. S. F., 1927.	Assistant District Forester, Sproul Forest District, Renovo, Pa.	Allegheny Sec.
Winch, Eugene C. Univ. of Me., B. S. F., 1927; Yale, M. F., 1930.	District Forester, State Forest Service, Bangor, Maine.	New England Sec.
Young, G. A. Mich. State, B. S. F., 1928.	Forest Assistant, Florida Forest Service, Wacissa, Florida.	Southeastern Sec.

## FOR ELECTION TO GRADE OF SENIOR MEMBER

Flory, Charles Henry Pa. Forest School, B. F., 1920. (Junior Member 1926)	Assistant State Forester, N. Car. Forest Service, Raleigh, N. Car.	Appalachian Sec.
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W. G. HOWARD,  
*Member of Council in Charge of Admissions.*

# SOCIETY OFFICERS

## Officers and Members of Executive Council

*President*, PAUL G. REDINGTON, Biological Survey, Washington, D. C.

*Vice-President*, JOHN D. GUTHRIE, Forest Service, Portland, Oregon.

*Secretary-Treasurer*, E. MORGAN PRYSE, Office of Indian Affairs, Washington, D. C.

### Executive Council

The Executive Council consists of the above officers and the following members:

	Term expires		Term expires
R. Y. STUART	Dec. 31, 1931	STUART B. SHOW	Dec. 31, 1933
ALDO LEOPOLD	Dec. 31, 1931	W. G. HOWARD	Dec. 31, 1931
T. T. MUNGER	Dec. 31, 1931	RALPH S. HOSMER	Dec. 31, 1933
CLIFTON D. HOWE	Dec. 31, 1933	CLAUDE R. TILLOTSON	Dec. 31, 1933

### Member in Charge of Admissions

W. G. HOWARD

### Section Officers

#### Allegheny

G. H. Wirt, Chairman, Department of Forests and Waters, Harrisburg, Pa.

R. D. Forbes, Vice-Chairman, Allegheny Forest Exp. Sta., 3437 Woodland Ave., Philadelphia, Pa.

H. F. Round, Secretary, Forester's Office, Pa. R. R. Co., Philadelphia, Pa.

#### Appalachian

E. H. Frothingham, Chairman, Appalachian Forest Experiment Station, Asheville, N. C.

Verne Rhoades, Vice-Chairman, P. O. Box 1927, Asheville, N. C.

W. K. Beichler, Secretary, N. C. Dept. Cons. & Devel., Asheville, N. C.

#### California

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Woodbridge Metcalf, Vice-Chairman, 332 Giannini Hall, Berkeley, Calif.

M. R. Brundage, Secretary, 332 Giannini Hall, Berkeley, Calif.

#### Central Rocky Mountain

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John W. Spencer, Vice-Chairman, Forest Service, Denver, Colo.

J. A. Donery, Secretary, Forest Service, Denver, Colo.

#### Gulf States

G. D. Marckworth, Chairman, Louisiana State University, Baton Rouge, La.

E. A. Ziegler, Vice-Chairman, Southern Forest Experiment Sta., New Orleans, La.

Robert Moore, Secretary, University Station, Baton Rouge, La.

#### Intermountain

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Earl C. Sanford, Vice-Chairman, Forest Service, Ogden, Utah.

S. B. Locke, Secretary, Forest Service, Ogden, Utah.

#### Minnesota

C. G. Bates, Chairman, University Farm, St. Paul, Minn.

R. M. Brown, Secretary, University Farm, St. Paul, Minn.

**New England**

Austin F. Hawes, Chairman, State Forester, Hartford, Conn.  
A. C. Cline, Secretary, Harvard Forest, Petersham, Mass.

**New York**

Arthur S. Hopkins, Chairman, Conservation Dept., Albany, N. Y.  
H. C. Belyea, Secretary, College of Forestry, Syracuse, N. Y.

**Northern Rocky Mountain**

I. W. Cook, Chairman, U. S. Forest Service, Missoula, Mont.  
S. N. Wyckoff, Vice-Chairman, U. S. Forest Service, Spokane, Wash.  
I. V. Anderson, Secretary, U. S. Forest Service, Missoula, Mont.

**North Pacific**

R. H. Chapler, Chairman, 304 Spalding Bldg., Portland, Ore.  
Fred W. Cleator, Secretary-Treasurer, Box 4137, Portland, Ore.

**Ohio Valley**

E. F. McCarthy, Chairman, Central States Forest Exp. Sta., Ohio University, Columbus, Ohio.  
F. W. Dean, Secretary, Morrison Hill, Wooster, Ohio.

**Ozark**

William L. Hall, Temporary Vice-President, 900 Prospect Ave., Hot Springs, Ark.

**Southeastern**

Harry Lee Baker, Chairman, State Forester, Tallahassee, Fla.  
H. A. Smith, Secretary, Asst. State Forester, Tallahassee, Fla.

**Southwestern**

G. A. Pearson, Chairman, Forest Service, Flagstaff, Ariz.  
D. A. Shoemaker, Vice-Chairman, U. S. Forest Service, Albuquerque, N. M.  
Stanley F. Wilson, Secretary, U. S. Forest Service, Albuquerque, New Mexico.

**Washington**

Ward Shepard, Chairman, 1039 Natl. Press Bldg., Washington, D. C.  
F. W. Reed, Vice-Chairman, Natl. Lumber Mfrs., Transportation Bldg., Washington, D. C.  
Alfred E. Fivaz, Secretary, Bureau Plant Industry, Washington, D. C.

**Wisconsin**

F. G. Wilson, Chairman, College of Agriculture, Madison, Wis.  
Edward C. Peck, Secretary, 2001 Monroe St., Madison, Wis.

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R. T. FISHER, *Director.*





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